ISSN 0253-4924

FOOD TECHNOLOGY Abstracts

Vol. 28 No. 2 February 1993

Central Food Technological Research Institute, Mysore
National Information System for Science and Technology
Department of Scientific and Industrial Research, New Delhi.

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FOSTIS, CFTRI,
Mysore 570 013,
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FOOD TECHNOLOGY ABSTRACTS

Vol. 28 No. 2
February 1993

National Information Centre For Food Science And Technology
Central Food Technological Research Institute,
Mysore - 570 013, India

Compiled and Edited by

B. Vasu
C. S. Anita
Geetha Seetharam

Abstractors to FTA

AA	Author's Abstract
BV	B. Vasu
CSA	C. S. Anita
GS	Geetha Seetharam
KAR	K. A. Ranganath
SD	S. Dhanaraj
SRA	S. R. Ananthnarayan
VKR	V. Krishnaswamy Rao

Computerisation and Database Creation

P. Manilal
C. S. Anita
B. Vasu
S. R. Ananthnarayan

Annual Subscription : Rs.250.00. US $ 85.00. Single Copy : Rs.25.00

FOOD
TECHNOLOGY
ABSTRACTS

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ABBREVIATIONS

A	ampere
AAS	atomic absorption spectrometry
ADP	adenosine diphosphate
Anon.	Anonymous
AOAC	Association of Official Analytical Chemists
approx.	approximately
atm	atmosphere
ATP	adenosine triphosphate
a_w	water activity
BHA	butylated hydroxyanisole
BHT	butylated hydroxytoluene
BOD	biological oxygen demand
b.p.	boiling point
Btu	British thermal unit
c-	centi- [as in cm, cm^2, cm^3]
cal	calorie
cd	candela
°C	degree centigrade
Ci	curie
CMC	carboxymethyl cellulose
COD	chemical oxygen demand
coeff.	coefficient
conc.	concentrated
concn.	concentration
cv.	cultivar
cwt	hundredweight
d-	deci-
DE	dextrose equivalent
detn.	determination
DFD	dark firm dry
diam.	diameter
dil.	dilute
DM	dry matter, Deutsche Mark
DNA	deoxyribonucleic acid(s)
dyn	dyne
E.	East, Eastern, etc
ECD.	electron capture detection
EDTA	ethylenediaminetetraaceti acid
Eh	oxidation-reduction potential
ELISA	enzyme-linked immunosorbent assay
f-	femto-[10^{-15}, as in fCi]
°F	degree Fahrenheit
FAO	Food and Agricultural Organization
FDA	Food and Drug Administration
FID	flame ionization detection
fl oz	fluid ounce
f.p.	freezing point
ft	foot, feet
g	gram

GC	gas chromatography
gr	gravity
gal	gallon
gf	gram-force
GLC	gas-liquid chromatography
h	hour
ha	hectare
HDPE	high density polyethylene
hl	hectolitre [100 1]
hp	horse power
HPLC	high performance/pressure liquid chromatography
HTST	high temperature short tim
Hz	hertz [frequency cycles/s]
in	inch
IR	infrared
IU	international unit
J	joule
k-	kilo- [as in kcalk, kg]
K	Kelvin
l	litre
lb	pound
lbf	pound-force
LDPE	low density polyethylene
m-	milli- [as in mg, ml, mm]
m-equiv	milli-equivalent
M	molar concentration
M-	mega- [as in Mrad]
max.	maximum
min	minute [time]
min.	minimum
mol	mole
mol.wt.	molecular weight
m.p.	melting point
MPN	most probable number
MS	mass-spectrometry
n-	nano-[10^{-9}, as in nm]
N	Newton [kg m/s^2]
N.	North, Northern, etc
N	Normal concentration
NMR	nuclear magnetic resonance
NPU	net protein utilization
oz	ounce
p-	pico- [10^{-12}, as in pCi]
P	Poise
p	probability
Pa	pascal (N/M^2)
PAGE	polyacrylamide gel electrophoresis
PER	protein efficiency ratio
p.p.b.	parts per billion
p.p.m.	parts per million
PSE	pale soft exudative
PTFE	polytetrafluorethylene
PVC	polyvinyl chloride
PVDC	polyvinylidene chloride

qt	quart
R	rontgen
rad	rad or radian
ref.	reference(s)
rev/min	revolutions per minute
RH	relative humidity
RNA	ribonucleic acid(s)
S.	South, Southern, etc.
s.d.	standard deviation
SDS	sodium dodecylsulphate
s.e.	standard error
s	second [time]
SNF	solids-not-fat
sp.,spp.	species
sp.gr.	specific gravity
summ.	summary
Suppl.	Supplement
t	metric tonne
temp.	temperature
TLC	thin layer chromatography
TS	total solids
UHT	ultra-high temperature
UV	ultraviolet
V	volt
var.	variety
vol.	volume
v/v	volume/volume
W	watt
W.	West, Western, etc.
WHO	World Health Organization
w/v	weight/volume
wk	week
wt.	weight
yd	yard
yr	year
μ	micro–[as in g, μm]
%	per centum
>	greater than
≥	greater than or equal to; not less than
<	less than
≤	less than or equal to; not greater than

ABBREVIATIONS FOR LANGUAGES

Language of text	
Dutch	Nl
French	Fr
German	De
Italian	It
Japanese	Ja
Norwegian	No
Spanish	Es
Swedish	Sv

GENERAL

250

Karel (M). **Advances in sciences and engineering - a challenge to food technology.** *Food Australia* 43(10); 1991; 459-463

Scientific developments and their impact on food technology (computer developments, biotechnology, material science of foods), engineered foods, developments in food processing and preservation, packaging advances and challenges for the future are the aspects covered in this article. SRA

251

Lehrer (SB) and O'Neil (CE). **Occupational reactions in the food industry.** *Food Technology* 46(5); 1992; 153-156

Food industry employees are exposed to a wide variety of substances (green coffee beans, flour and shellfish which are protein allergens and non-food agents such as honeybees, grain storage mites, antibiotics, thermophilic actinomycetes and rubber boots) which can induce allergic reactions and lead to various occupational diseases such as occupational asthma, hypersensitivity penumonitis and dermatitis. Agents associated with occupational reactions, diagnosis, treatment of occupational asthma and coffee bean hypersensitivity are the various aspects discussed in this article. CSA

FOOD PROCESSING

252

Rodriguez (AC), Smerage (GH), Teixeira (AA), Lindsay (JA) and Busta (FF). **Population model of bacterial spores for validation of dynamic thermal processes.** *Journal of Food Process Engineering* 15(1); 1992; 1-30

Data are presented supporting a new model of spore populations during isothermal and dynamic lethal heat treatments. The model incorporates activation, injury, and preliminary inactivation of less-resistant fractions as well as the usual predominant inactivation. Rate constants of those transformations were determined exp. for *Bacillus subtilis* strain A and were found to vary with temp. according to Arrhenius equations. Model generated and exp. isothermal survivor curves compared well. Comparison of model and exp. survivor curves for this species in a time-varying temp. regime showed the model to be a potentially good predictor of survivors during dynamic lethal heat treatment. The new model could be particularly important in simulating sterilization and pasteurization processes, especially short duration UHT treatments, and microbiological validation of arbitrary, dynamic thermal processes. AA

253

Mertens (B) and Knorr (D). **Developments of nonthermal processes for food preservation.** *Food Technology* 46(5); 1992; 124, 126-133

Some key developmental activities concerning the process developments that deal with the design and application of nonthermal food preservation processes which include the utilization of electric or magnetic fields, microwave radiation, ionizing radiation, light pulses, high isobaric pressure, chemical agents such as CO_2 and polycationic polymers and lytic enzymes are summarized. CSA

FOOD PACKAGING

254

Sharada Prasad. **Closure systems for processed food and beverage cans.** *Packaging India* 24(6); 1992; 31

Covers the advantages of using an Al can with different types of easy-to-open-ends (pour aperture type used for packing of liquids and full aperture type used for packing of solids and powders) for packaging of processed foods and beverages. CSA

255

Yoshii (J). **Recent trends in food packaging development in consideration of environment.** *Packaging Japan* 13(67); 1992; 74-80

Recent trends in food packaging, the future of food packaging, properties of packaging materials, environment friendly package (enviropet), PET recycling, silica coated film and chemical barrier such as CMB' OXBAR system are the aspects covered in this article. CSA

256

Vinoy Purushottam, Mahadeviah (M), Gowramma (RV) and Naresh (R). **Packaging of some fruit and vegetable products in glass containers.** *Journal of Food Science and Technology (India)* 29(6); 1992; 368-370

Suitability of indigenously available glass containers has been studied for packing mango juice, banana puree, tomato puree and processed peas. Reduction in β-carotene was found to be less in amber coloured bottles compared to colourless bottles. Corrosive products like banana and tomato puree could be safely packed in glass bottles. Acidification of brine was found essential for packing processed peas in glass bottles. AA

Packaging materials

Aluminium

257

Sankaran (R). **Progress in food processing through aluminium packaging.** *Packaging India* 24(6): 1992; 5, 7

Briefly covers progress made by the Indian food processing industries in the use of Al in food packaging and the advantages associated with it. CSA

258

Bhelande (HU). **Food and foil - status and prospects.** *Packaging India* 24(6): 1992; 15-18

The advantages of Al foil and its use in the industry for wrapping biscuits, chocolates, pouches for snack foods, ground spices, coffee etc, superwrap, tetra pak, retortable pouches for processed foods, foil trays, retortable trays and aluseal are discussed in this article. CSA

259

Lahiri (A). **Aluminium rigid container for processed food.** *Packaging India* 24(6): 1992; 19, 21-23, 25-27, 29

Aspects covered in this article include an overview of the packing industry in India; the suitability of Al for storing various food products (fish, meat, fruits, fruit juices, jam/jelly, butter/cheese, margarine, coffee/tea, pickles); the methods for production of Al containers (impact extruded containers, drawn cans (two piece), three piece cans); behaviour of Al with various substances including food products; theory of corrosion, factors affecting corrosion, corrosion and Al, galvanic corrosion and types of corrosion (pitting corrosion, intergranular corrosion, exfoliation corrosion, stress corrosion). CSA

FOOD ENGINEERING AND EQUIPMENT

260

Driscoll (RH) and Intong (CL). **Modelling of recirculation for through-drying of granular products.** *Food Australia* 43(10): 1991; 456-458

An in-bin drying model for granular food products modified to incorporate recirculation of exit air is used to compare dryer operating efficiency at varying amounts of recirculation. A simple prediction allows dryer operation to be optimised by measurement of a saturation parameter for the exit air. For a particular product, the optimum recirculation rate can be predicted from measurement of the exit air conditions, suggesting a direct method of computer-control for the dryer. Use of high air speed, energy analysis of a deep-bed dryer, initial simulation results, development of simple model are described. SRA

261

Goedeken (DL), Tong (CH) and Lentz (RR). **Design and calibration of a continuous temperature measurement system in a microwave cavity by infrared imaging.** *Journal of Food Processing Preservation* 15(5): 1991; 331-337

262

Karwe (MV) and Tong (CH). **Effect of filling material on the temperature distribution in a thermal conductivity probe and thermal conductivity measurements: A numerical study.** *Journal of Food Processing Preservation* 15(5): 1991; 339-357

A numerical investigation taking into account the composite nature of a line thermal conductivity probe was carried out using a finite-difference technique, to study the temp. distribution inside a thermal conductivity probe for different filling materials. Air, mercury and a high thermal conductivity paste were used as the filling materials. The radial temp. gradient in a mercury filled probe was small, while a large temp. gradient was found in an air filled probe. It was found that the location of the thermocouple in the probe has very little or no effect on the calculated thermal conductivity values, for all 3 filling materials tested. The plots of temp. rise versus natural logarithm of time were piece wise linear. Correct thermal conductivity could be obtained only when an appropriate time interval was selected for calculation of slope. The time interval depended upon the type of filling material and the thermal capacity of the sample. AA

263

Xiong (X), Narasimhan (G) and Okos (MR). **Effect of composition and pore structure on binding energy and effective diffusivity of moisture in porous food.** *Journal of Food Engineering* 15(3): 1991; 187-208

Food samples of different compositions were formulated by extruding mixtures of starch and gluten of different compositions, whereas samples of varying pore structure were obtained through extrusion of durum semolina at 57 and 137°C. Experimental measurements of desorption isotherm of these samples at different temp. in the range 25 - 40°C indicated that the water binding ability was fairly insensitive to the pore structure of food samples and was found to be lower for extruded and pregelatinized samples as well as for samples of higher gluten content. Experimental desorption isotherm data were represented by the Oswin equation in order to evaluate moisture binding energy as a function of moisture content and temp. by employing the Clausius-Clapeyron equation. Binding energy was found to be negligible at high moistures (above 0.2 d.b.), increasing at lower moisture contents, lower temp. and higher starch contents, Effective diffusivity of moisture through different moisture contents and temp. was inferred from drying curves in the temp. range 60 - 105°C. Effective diffusivity (D_{eff}) was higher in pregelatinized samples and was found to be much higher through porous puffed pasta than regular pasta. The effect of composition on D_{eff} was confounded by the effect of pore structure as a result of variations in pore size distribution in the extruded samples of different compositions. The decrease in D_{eff} at lower moisture contents was postulated to be due to the decrease in the available free water for diffusion and was explained through a simple model which related the available free moisture to the binding energy. AA

264

Sumer (A) and Esin (A). **Effect of can arrangement on temperature distribution in still retort sterilization.** *Journal of Food Engineering* 15(4): 1992: 245-259

A general dynamic mathematical model was developed to predict the effect of can arrangement geometry on temp. distribution within cans in still retorts. For this purpose, the temp. variation in the cans was recorded for various can arrangements. Also, the influence of the physical properties of the material and the mechanism of heat transfer for heat penetration were studied. Exp. were carried out with water, peas in brine and tomato paste in no. 3 cans in an exp. vertical still retort. The equations employed for modelling were elliptic partial differential equations. They were solved numerically on a microcomputer using the finite element method. AA

265

Rahman (MS). **Thermal conductivity of four food materials as a single function of porosity and water content.** *Journal of Food Engineering* 15(4): 1992: 261-268

A thermal conductivity prediction regression equation was developed for 4 food materials as a single function of moisture content, porosity and initial thermal conductivity. It was assumed that temp. has a negligible effect on thermal conductivity. Thermal conductivity values of beef, apple, potato, pear and squid were used to develop the regression equation considering 122 points from the literature. The regression coeff. was 0.992. Squid gave the max. mean % deviation of 11.89 (standard deviation 14.39). Potato gave min. mean % deviation of 4.10 (standard deviation 1.74). AA

266

Campbell (S) and Ramaswamy (HS). **Distribution of heat transfer rate and lethality in a single basket water cascade retort.** *Journal of Food Process Engineering* 15(1): 1992: 31-48

Temp. and heat distribution studies were carried out in a single basket horizontal water cascading retort at 2 temp. and 2 air over-pressure levels under fully loaded operating conditions. Various heat transfer parameters (heating and cooling rate indices, f_h and f_c), lag factors (j_{ch} and j_{cc}) and process lethality (F_o) were used as indicators of the retort performance. Time-temp. data gathered from 24 Lexan™ transducers were used for calculation of the heating and cooling rate indices as well as lethality. There were significant variations in the temp. distribution and heat transfer parameters at the different tray levels; however, these variations did not contribute to large variations in the accumulated overall process lethality. AA

267

Peleg (M). **On the use of the WLF model in polymers and foods.** *CRC Critical Reviews in Food Science and Nutrition* 32(1): 1992: 59-66

The validity of the WLF model with fixed "universal" coeff. was tested against that of the model original form with variable coeff. using published coeff. of polymers and amorphous sugars crystallization and viscosity data. The disagreement between the 2 versions of the model is particularly large at temp. ranges starting about 20 to 30°K above the glass transition or reference temp., excluding the former from being a model of general applicability. Because the WLF model mathematical structure entails the existence of an almost linear region near the reference temp., establishment of its validity as a kinetic model and meaningful detn. of its constants requires data spread over an extended temp. range, especially when the experimental results have a scatter. AA

268

Kirby (C). **Microencapsulation and controlled delivery of food ingredients.** *Food Science and Technology Today* 5(2): 1991: 74-78

This feature article discusses about microcapsule, role of microencapsulation and areas of application. BV

269

Hossain (MM), Cleland (DJ) and Cleland (AC). **Prediction of freezing and thawing times for foods of regular multi-dimensional shape by using an analytically derived geometric factor.** *International Journal of Refrigeration* 15(4): 1992: 227-234

Simple and better analytical formulae based on Biot number and parameters describing object shape (a number of regular two- and three dimensional objects) were found to predict freezing and thawing times of foods accurately as demonstrated by comparisons with large sets of experimental food freezing and thawing data. SD

270

Hossain (MM), Cleland (DJ) and Cleland (AC). **Prediction of freezing and thawing times for foods of two-dimensional irregular shape by using a semi-analytical geometric factor.** *International Journal of Refrigeration* 15(4): 1992: 235-240

Better semi-analytical formulae, based on Biot number and geometric parameters - characteristic dimension, vol. and surface area of products of irregular shape were found to predict accurately the freezing and thawing times as validated by experimental data. SD

271

Hossain (MM), Cleland (DJ) and Cleland (AC). **Prediction of freezing and thawing times for foods of three-dimensional irregular shape by using a semi-analytical geometric factor.** *International Journal of Refrigeration* 15(4): 1992: 241-246

By use of a model ellipsoid defined as having the same vol., characteristic dimension and smallest orthogonal cross-sectional area as the acutal shape in conjunction with the proposed shape factor, published experimental freezing and thawing times of products were more accurately predicted than by other shape factor. SD

Equipments

272

Malcata (FX). **Modelling of a series of continuously stirred tank reactors for thermal processing of liquid foods.** *International Journal of Food Science and Technology* 26(5): 1991: 535-546

A series of stirred tanks for the thermal treatment of liquid foods is easy to model and operate. Good modelling leads to accurate predictions and small uncertainties in the lethality, giving a safe food product because of a small chance of underprocessing. Mathematical proof is presented that the min. overall reactor vol. for a given degree of thermal destruction of cells or spored is obtained when the stirred tanks are of equal size. Analytical techniques based on theoretical residence time distribution are employed to find the optimum number of tanks in the series using capital and operation costs in the definition of the objective function. If typical scaling factors are used, these optima depend only on the degree of reduction of viable cells/spores sought and a dimensionless economic parameter relating operating and capital costs if a single stirred tank were employed. AA

273

Barres (C), Vergnes (B) and Tayeb (J). **An improved thermal model for the solid conveying section of a twin-screw extrusion cooker.** *Journal of Food Engineering* 15(3): 1991: 167-185

A new analysis of mass and heat transfer in the partially filled conveying section of a twin-screw cooker extruder is presented. An original hypothesis, suggested by observations made during dead-stop exp., was introduced into the thermal model. A layer of material is assumed to be located in the clearance between the barrel and the tip of the screw flight. This layer is heated by conduction from the temp.-controlled barrel, and releases some energy to the solid powdery material transported in the screw channel. In parallel, the screws are assumed to be the origin of a large fraction of the heat supplied to the product. Complete temp. profiles along the solid conveying section were computed. The influence of different process parameters was evaluated. The results prove to be qualitatively satisfactory and in agreement with measurements. The limits of this model come from the fact that more complex phenomena (including friction between granules) have to be taken into account as soon as the screw channel is completely filled. AA

ENERGY IN FOOD PROCESSING

Nil

274

Stevenson (MH). **Detection of irradiated food.** *Food Science and Technology Today* 5(2); 1991; 69-73

The author discusses the techniques such as electron spin resonance spectroscopy, formation of volatile compounds from lipids including long chain hydrocarbons and 2-alkylcyclobutanones, and thermoluminescence used for detection of irradiated foods and to quantify the irradiation dose absorbed by food. BV

Chemistry

275

Mavelle (T), Bouchikhi (B) and Debry (G). **The occurrence of volatile N-nitrosamines in French foodstuffs.** *Food Chemistry* 42(3); 1991; 321-338

N-nitrosodimethylamine was found in 89% of 258 food samples and 53 beverages in Eastern France in 1987-88 with a max. level of 16 μg/kg, the highest being found in fruit spirits, and lower in beer. Appreciable amounts of N-nitrosamine were found in nitrite-cured meats, smoked meats and fishes while the other N-nitrosamines being rare and ususally below 0.5 μ/kg. SD

276

de Cindio (B), Grasso (G) and Cacace (D). **Water-in-oil-in-water double emulsions for food applications: Yield analysis and rheological properties.** *Food Hydrocolloids* 4(5); 1991; 339-353

Water-in-oil-in-water (W/O/W) emulsions are systems in which a water-in-oil (W/O) emulsion is dispersed in a second aqueous phase. The W/O emulsion exists in the suspending aqueous medium as oil globules containing smaller water droplets. In this work the techniques of preparation and yield analysis of W/O/W emulsions are described; microstructure and rheological behaviour are also studied with a view to possible food applications. In order to prepare W/O/W emulsions, a 2-step emulsification technique was used. During the first step, a W/O emulsion was prepared in the presence of a lipophilic emulsifier while, during the second step, the W/O emulsion was mixed with an aqueous sol. of a hydrophilic emulsifier to provide the W/O/W system. The yield of W/O/W emulsion was evaluated by measuring the amount of an ionic marker (NaCl) which migrated from the dispersed globules to the continuous aqueous phase, using dialysis to separate the NaCl migrated from the aqueous medium and using ionic chromatography to detect the amount of the NaCl outcome. The microstructure was investigated by making phase-contrast microscope photographs and estimating the size distribution of the oil globules. Finally, the rheological behaviour of W/O/W systems was studied by means of both steady-shear and oscillatory measurements. AA

277

Ohashi (S), Ura (F), Takeuchi (M), Iida (H), Sakaue (K), Ochi (T), Ukai (S), Hramatsu (K). **Interaction of thaumatin with carrageenans. II. Effects of pH, temperature and competing cations studied by circular dichroism.** *Food Hydrocolloids* 4(5); 1991; 379-394

Interaction of thaumatin with carrageenans was studied spectroscopically on the basis of circular dichroism (CD) at pH 3 - 7 and 20 - 60°C and examined from estimating the sweetness of the complex. The results obtained are summarized as follows: (i) The max. reaction ratios of thaumatin to carrageenan correlated with pH. (ii) At reaction temp. of 20 and 40°C there were different modes of structural change in thaumatin due to its binding to carrageenan between pH 3 - 4 and pH 5 - 7, accompanying a remarkable reduction of sweetness intensity of thaumatin at pH 3 - 4 and a lesser reduction at pH 5 - 7. (iii) At a reaction temp. of 60°C, the CD spectra at pH 3 and pH 7 seem to reflect at least the interaction of a structurally changed thaumatin and carrageenan in an random coil form. The most noticeable reduction in sweeteness intensity of thaumatin was at pH 3 - 4 and less sweetness reduction occurred at pH 5 - 7. (iv) At a reaction temp. of 40 C, Ca^{2+} or K^{+} ranked first among Ca^{2+}, Na^{+} and K^{+} in inhibitory action on the interaction of thaumatin with carrageenan and inability to dissociate the thaumatin-carrageenan complex. These cations inhibited completely at pH 5 - 7 but partially at pH 3 - 4. Also, thaumatin was completely dissociated from a thaumatin-carrageenan complex at pH 5 - 7 when a salt was added to the complex formation at pH 5 - 7 is due to electrostatic bonding (ionic bonds), but that at pH 3 - 4 another bonding mechanism is also involved. AA

278

Kirby (CJ), Whittle (CJ), Rigby (N) Coxon (DT) and Law (BA). **Stabilization of ascorbic acid by microencapsulation in liposomes.** *International Journal of Food Science and Technology* 26(5); 1991; 437-449

Ascorbic acid was encapsulated with high efficiency inside liposomes. In this form, its stability was enhanced compared to that in free aqueous sol., and particularly in the presence of a number of factors widespread in foods, which normally lead to its rapid degradation. Possible mechanisms for these stabilizing effects are discussed. Amongst other potential applications, these findings are relevant to the preservation of nutritional supplements of vitamin C in sol. and to the development of naturally derived antioxidant systems for food protection. AA

279

Chakraborty (MK) and Patel (KV). **Chemical composition of Isabgol (*Plantago ovata* Forsk) seed.** *Journal of Food Science and Technology (India)* 29(6); 1992; 389-390

Dehusked isabgol seed had low oil content with a lipid profile high in free fatty acids, sterols and hydrocarbons making the oil a non-edible type. The defatted meal had high proportion of protein with high albumin, high lysine, medium methionine and digestible protein comparable to red gram *dhal*. AA

Chemistry (Analytical)

280

Mahesh (DL), Deosthale (YG) and Narasinga Rao (BS). **A sensitive kinetic assay for the determination of iodine in foodstuffs.** *Food Chemistry* 43(1); 1992; 51-56

A spectrophotometric kinetic assay for the detn. of iodine in foodstuffs is detailed. Iodine added to foods in the range 94 - 102% showed a recovery mean of 97 plus or minus 3.3%. The standardised method with detection limit of 0.4 ng and a sensitivity of 40 pg can also be adopted to determine iodine in serum, urine and other biological materials. SD

281

Russell (LF) and Vanderslice (JT). **Comments on the standard fluorometric determination of riboflavin in foods and biological tissues.** *Food Chemistry* 43(1); 1992; 79-82

The AOAC standard fluorometric procedure is shown not universally suitable for samples containing active enzyme systems or high concn. of fat. So a modification to permit the use of flow injection analysis is reported. SD

282

Oles (PJ) and Graham (WM). **Microwave acid digestion of various food matrixes for nutrient determination by atomic absorption spectrophotometry.** *Journal of the Association of [illegible]cial Analytical Chemists* 74(5); 1991; 812-814

Microwave digestion is a rapid and readily automated approach for the preparation of a variety of food matrixes for nutrient detn. by flame AAS. Acceptable recoveries of spikes are obtained, and results are equivalent to hot plate digestions. Perchloric acid can be eliminated in the digestion, which offers additional advantages. BV

283

Tan (S), Tatsuno (T) and Okada (T). **Gas chromatographic/mass spectrometric determination of α-methylstyrene in styrene-based polymers and food simulants.** *Journal of the Association of Official Analytical Chemists* 74(5); 1991; 815-818

A selected ion monitoring method is described for the analysis of styrene (St)-based polymers for α-methylstyrene (α-MSt) and for determining the level of α-MSt migration from St-based sheets into 4 food simulants. The polymers are dissolved in dichloromethane; α-MSt is determined by direct injection of the polymer sol. α-MSt migration from St-based sheet to water, 4% acetic acid, 20% ethanol, and n-heptane was measured by GC/MS, using multiple ion monitoring of ions at m/z 118, 78 and 91. α-MSt can be quantitated at levels as low as 10 μg/g in the polymer and 0.01 μg/g in the food simulants. Recoveries were 83-113% from St-based sheets and 90-99% from food simulants, respectively. AA

284

Graham (DM), Filer (LJ) and Bigelow (SW). **A new approach for assessing the dietary exposure to food additives.** *CRC Critical Reviews in Food Science and Nutrition* 32(2); 1992; 157-160

Dietary Exposure Assessment Method (DEAM) proposed in this article can greatly improve the accuracy of food additive intake estimates. This method is also useful in reassessment of the risks associated with food chemicals. Other potential uses include estimating exposure to environmental chemicals (e.g., Pb), nutrient intake data (e.g., under consumption of starches, over consumption of fats, or the nutritional impact of macronutrient substitutes and pesticide residues (e.g., ethylene bisdithiocarbamates) in the food supply. 14 references. BV

285

So (RS), Madamba (LSP), Deseo (MA) and Migo (VP). **Determination of moisture in some food and agricultural materials using gas chromatography.** *ASEAN Food Journal* 6(4); 1991; 145-150

The use of a GC method for route analysis of moisture in a wide range of sample (rice bran, rice hull, bagasse, sweet potato peel, rice straw, copra meal and molasses) is described. This method involves extraction of water with an appropriate solvent (methanol) prior to GC analysis. The results showed that the detection response to water was linear upto 2.5%. The sensitivity of the method was 0.731 and the min. detectable limit was 0.25% water in the extract. Mean standard deviation of 10 replicates using the GC method was plus or minus 0.23% and the mean coeff. of variation (% cv) was 2.32%. An accuracy study showed an av. recovery of 98%. SRA

FOOD MICROBIOLOGY AND HYGIENE

Fermented foods

Tempeh

286

Ashenafi (M) and Busse (M). **Microbial development during *tempeh* fermentation from various beans and effect of *Lactobacillus plantarum* on the natural microflora.** *International Journal of Food Science and Technology* 26(5); 1991; 501-506

The microbial development during the fermentation of *tempeh* made of unacidified and acidified horsebean, pea, chickpea and soybean was studied. Increase in microbial count was observed during the fermentation of the various beans. *Bacillus* spp. and coryneform bacteria dominated the microflora and unacidified, and streptococci of acidified horsebean *tempeh*. In pea *tempeh*, loctobacilli dominated, in chickpea, micrococci, staphylococci and coryneform bacteria and in soybean *tempeh*, enterococci were the dominant genera. Inoculation of the cooked beans with *Lactobacillus plantarum* resulted in a lower pH and lower total counts in the various products. The use of *L. plantarum* in *tempeh* production may control the proliferation of undesirable microorganisms. AA

Microorganisms

287

Elliott (PH), Evancho (GM) and Zink (DL). **Microbiological evaluation of low-acid aseptic fillers.** *Food Technology* 46(5); 1992; 116, 118-122

Aspects discussed in this article are the microbiological methods used to establish critical factors for low-acid aseptic fillers, validating sterilization processes, challenging container sterilization, calculating log cycle reduction, confirming equipment sterilization, determining spore resistance, demonstrating sterile air and standardizing the methods. CSA

Fungi

Penicillium aurantiogriseum

288

Surekha (M) and Reddy (SM). **Efficacy of food preservatives in the control of penitrem-B production by *Penicillium aurantiogriseum*.** *Journal of Food Science and Technology (India)* 29(6); 1992; 397-398

Different food preservatives were screened for their efficacy in the control of penitrem-B production by *P. aurantiogriseum*. Acetone, sodium metabisulphate and propionic acid were found to be effective in the control of peniterm-B production by *B. aurantiogriseum*. Rest of food preservatives were ineffective in checking the production of penitrem-B. AA

Yeasts

289

Kronlof (J) and Haikara (A). **Contamination of immobilized yeast bioreactors.** *Journal of the Institute of Brewing* 97(5); 1991; 375-380

Microbiological contamination of immobilized yeast bioreactors for lagering of beer was studied. 4 common brewery contaminants and 2 contaminants isolated from the continuous processing system were tested for their ability to survive and grow in the packed bed DEAE-cellulose bioreactors. Bacterial contaminants were washed out within less than 6 wks without causing any alterations in the flavour composition of the beer. The initial contamination levels were 10^4 - 10^6 cells ml^{-1}. Gram positive lactic acid bacteria, *Lactobacillus brevis* and *Pediococcus damnosus*, were more persistent than a Gram negative wort bacterium, *Enterobacter agglomerans*. The wild yeasts *Saccharomyces cerevisiae* (*ex. diastaticus*) and *Candida krusei* were the most persistent contaminants and the only ones able to grow in the reactors. Another wild yeast, *Rhodotorula rubra*, did not survive in competition with brewer's yeast and was washed out within a few wks. *C. krusei* and *R. rubra* were previously isolated from a spontaneously contaminated system. None of the contaminants caused formation of phenolic or other off-flavour compounds in detectable levels. AA

BIOTECHNOLOGY

290

Hess (CE). **Biotechnology - derived foods from animals.** *CRC Critical Reviews in Food Science and Nutrition* 32(2): 1992: 147-150

291

Medley (TL). **Status of regulatory approval of biotechnology - derived plants and animals.** *CRC Critical Reviews in Food Science and Nutrition* 32(1): 1992: 151-155

292

Stanely (DW). **Biological membrane deterioration and associated quality losses in food tissues.** *CRC Critical Reviews in Food Science and Nutrition* 30(5): 1991: 487-553

This review covers: the biological membranes (properties), the role of membranes in living tissue, membrane deterioration (measurement and mechanism, food tissues, controlling membrane deterioration) summary, conclusions and recommendations. 218 references. SRA

TISSUE CULTURE

Nil

FOOD ADDITIVES

293

Ahmed (M) and Dickinson (E). **Foaming of aqueous solutions of protein + propylene glycol alginate.** *Food Hydrocolloids* 4(5): 1991: 395-402

Volumes of foams produced by sparging have been determined as a function of pH for dilute aqueous sol. containing a mixture of propylene glycol alginate (PGA) and a food protein (β-casein, β-lactoglobulin, gelatin or soy protein) in the ratio 10:1 by wt. At a concn. insufficient to give significant foaming on its own, each protein gives an enhancement in the foaming capacity of PGA at pH 7. The order of effectiveness of the proteins is: β-casein > β-lactoglobulin > gelatin > soy protein. The results are consistent with the formation of a weak electrostatic complex between protein and polysaccharide at the air-water interface under neutral pH conditions. AA

294

Hinton (DM). **Testing guidelines for evaluation of the immunotoxic potential of direct food additives.** *CRC Critical Reviews in Food Science and Nutrition* 32(2): 1992: 173-190

Immunotoxicity testing is a new addition to the safety assessment guidelines for direct food and colour additives. The approaches and philosophy for this area of specialized testing are consistent with the case-by-case strategy applied in the regulatory approval process, which is based on structure-activity relationships, preexisting knowledge, and projected exposure estimates. Specialized testing such as immunotoxicity is not part of the basic testing requirements, but would be applied when indicators are positive. Concepts for immunotoxicity testing have evolved, in part, from research for evaluating various testing methods as well as specific study designs. This research conducted over the last decade has focussed mainly on the rate as the rodent sp. of choice. The miniature swine was evaluated as a nonrodent model. Testing is defined by type 1 and type 2 tests, which differ in that type 1 tests are performed on the same animals used in the core study design. Sets of type 1 and type 2 tests, with reference to the indicators, define various testing levels. Retrospective testing, expansion of basic testing (such as histopathology and serum chemistry profiles), and alternative study designs, which include satellite groups for evaluation of the functional capacity of the immune system, can be considered in the evaluation of immunotoxic potential. 89 references. AA

295

Lin (CS). **Evaluating the safety of food and colour additives with pharmacokinetic data.** *CRC Critical Reviews in Food Science and Nutrition* 32(2): 1992: 191-195

Reviews the current scientific knowledge on properly designed pharmacokinetic studies applied in evaluation of the safety of food and colour additives and the limitations of such practical applications. Aspects covered include, use of pharmacokinetic data in safety evaluation (application of pharmacokinetic data in the design of toxicity studies, contribution of pharmacokinetic data in dose selection, use of pharmacokinetic data to aid in the interpretation of results obtained from toxicity studies, and use of pharmacokinetic data to improve the risk assessment process. 24 references. SRA

296

Schiffmann (D) and Schlatter (J). **Genotoxicity and cell transformation studies with sorbates in Syrian hamster embryo fibroblasts.** *Food and Chemical Toxicology* 30(8): 1992: 669-672

Sorbic acid, sodium sorbate and potassium sorbate were tested for their genotoxic potential in the Syrian hamster embryo (SHE) fibroblast micronucleus assay and the SHE cell transformation test *in vitro*. Sorbic acid and potassium sorbate showed no activity in either test system. When freshly prepared sodium sorbate sol. were used, no genotoxic or cell-transforming activity was detected. However, sodium sorbate as stored sol., which previously had been heated and sonicated to facilitate solubilization, yielded a positive response in both test systems. It is concluded that oxidation products of sodium sorbate that possess genotoxic and cell-transforming properties are formed under conditions of heating, sonication and storage. AA

Antioxidants

297

Shahidi (F), Janitha (PK) and Wanasundara (PD). **Phenolic antioxidants.** *CRC Critical Reviews in Food Science and Nutrition* 32(1); 1992; 67-103

Phenolic antioxidants of both synthetic and natural origin, their mode of action and the active components of naturally occuring plant foods are discussed in this review. Aspects covered include: autoxidation-general considerations, mechanism of lipid autoxidation, prevention of autoxidation and use of antioxidants, estimation of antioxidant activity, types of antioxidants (mechanism of action of phenolic antioxidants, synthetic food phenolic antioxidants, BHA and BHT, TBHQ, propyl gallate (PG), nordihydroguaiaretic acid, degradation products of phenolic antioxidants and their antioxidant activity, degradation products of antioxidants mixtures and their antioxidant activity), natural antioxidants (tocopherols, mechanism of antioxidant activity of tocopherol, extraction of tocopherol from natural sources, phenolic acids and flavonoids, structure-activity relationships) natural sources of plant antioxidants (soybean, peanut and cottonseed, mustard and rapeseed, rice, sesame seed, canary seeds, tea, herbs and spices, rosemary and sage, oregano, mace, black pepper, turmeric), other sources of antioxidants (olive, onion, sweet potato, oats, guaic gum, creosote bush exudate/leaf wax, fungi wood smoke), toxicology of phenolic antioxidants used as food additives (tocopherol, BHA, BHT, TBHQ, PG, flavonoids) and future research needs. 110 references. SRA

CEREALS

298

Sopade (PA), Ajisegiri (ES) and Badau (MH). **The use of Peleg's equation to model water absorption in some cereal grains during soaking.** *Journal of Food Engineering* 15(4); 1992; 269-283

Water absorption during soaking of maize, millet and sorghum at $10^{\circ}C$, $30^{\circ}C$ and $50^{\circ}C$ was studied using Peleg's equation. The equation gave a reasonable fit to experimental data. Peleg constants were obtained for the cereals. The constant K_2 was unaffected by temp. of soaking. Temp. dependence of the reciprocal of the Peleg constant K_1 was determined using an Arrhenius equation. Activation energy was in the range 13.99 - 16.23 $MJmol^{-1}$ compared to 19.02 - 19.56 $MJ\ mol^{-1}$ obtained for soybean, cowpea and undehulled groundnut. An exponential relationship was proposed to describe the relationship between the rate of absorbed water per unit change in temp. and the activation energy. AA

299

Knuckles (BE), Chiu (MM) and Betschart (AA). **β-Glucan-enriched fractions from laboratory-scale dry milling and sieving of barley and oats.** *Cereal Chemistry* 69(2); 1992; 198-202

Dry milling and sieving of barley and oats produced fractions that were enriched in β-glucan [(1-3), (1-4)-β-D-glucan]. Hulled and hulless var. of barley and defatted rolled oats and oat bran, containing < 10% moisture, were ground and sieved with a 325-mesh screen (45-μm openings). Coarse material retained by the screen was reground and resieved. The resulting coarse fraction, with a wt. yield of 18 - 30%, contained 16-27% total β-glucan. Further sieving of this β-glucan-rich fraction with a 100-mesh screen (147-μm openings) yielded fractions representing 1.7 - 16.5% of the kernel wt. and containing up to 28% total β-glucan. The water-soluble β-glucan was about 55% of the total β-glucan for all test materials except Wanubet barley, in which soluble β-glucan ranged from 60 - 70% of the total β-glucan. Dry milling and sieving techniques can be used to prepare barley and oat fractions with β-glucan concn. 2.4 - 4.9 times those of the original grain. AA

300

Anon. **Demonstration of the 2-gram mixograph as a research tool.** *Cereal Chemistry* 69(2); 1992; 229

Rice

301

Paramasivam (P), Perumal (R), Gopalaswamy (A) and Subramaniam (S). **Effect of ameliorants on yield, uptake of nutrients and quality of rice under**

sodic soils. *Andhra Agricultural Journal* 37(4): 1990: 357-362

Inorganic amendment gypsum and organic amendments such as pressmud, groundnut shells, paddy husk and their combinations, when applied to rice grown in sodic soil, increased the rice protein content from 5.68 to 7.74%. GS

302

Varadaraj (MC), Keshava (N), Nirmala Devi, Dwarakanath (CT) and Manjrekar (SP). **Occurrence of *Bacillus cereus* and other *Bacillus* species in Indian snack and lunch foods and their ability to grow in a rice preparation.** *Journal of Food Science and Technology (India)* 29(6): 1992: 344-347

Bacillus brevis, *B. cereus*, *B. circulans*, *B. coagulans*, *B. laterosporus*, *B. licheniformis*, *B. pumilus*, *B. stearothermophilus* and *B. subtilis* were isolated from Indian snack and lunch foods. Higher count of 4.2 $\log_{10}$ (cfu/g) and a lower count of 2.6 $\log_{10}$ (cfu/g) were observed in *bisibele bhath* and *uppuma*, respectively. The isolated cultures were positive for production of either one or more of the following: hemolysins, phospholipase, protease, lipase and amylase. A few selected cultures of *Bacillus* sp. occurrring as post-processing contaminants in plain cooked rice reached cell populations which were sufficient to cause health hazards. These findings indicate the significance of *Bacillus* sp. as post-processing contaminants in processed foods. AA

Brown rice

303

Champange (ET) and Hron (RJSr). **Stabilizing brown rice to lipolytic hydrolysis by ethanol vapors.** *Cereal Chemistry* 69(2): 1992: 152-156

Brown rice can be stabilized to lipolytic hydrolysis by exposure to vapors from boiling aqueous ethanol (EtOH). During 6 months of storage at 36°C, free fatty acids increased little or none in brown rice kernels treated with EtOH vapors for 3 - 10 min. Flours produced from treated kernels had low residual lipase activity. Treated kernels and flours prepared from them were more susceptible to oxidative deterioration than untreated kernels and flours, as indicated by increases in conjugated diene hydroperoxide content during storage. EtOH vapor treatment lowered the moisture content of the 12.8%-moisture brown rice kernels approx. 1.5%; loss of kernel oil was < 3%. The water content of 8%-moisture kernels was not changed, and no oil was extracted by the EtOH vapor treatment. Thiamin and tocopherols were not lost in EtOH vapor-treated kernels. Thermal curves of treated and untreated kernels obtained by differential scanning calorimetry indicated no starch gelatinization in the treated kernels. EtOH vapor treatment of brown rice kernels reduced microbial populations to very low levels. AA

Wheat

304

Dong (H), Sears (RG), Cox (TS), Hoseney (RC), Lookhart (GL), Shogren (MD). **Relationships between protein composition and mixograph and loaf characteristics in wheat.** *Cereal Chemistry* 69(2): 1992: 132-136

To study the relationships between protein composition and baking properties of 135 randomly selected wheat (*Triticum aestivum*) lines from a randomly mated population, gliadin proteins by acidic buffer polyacrylamide gel electrophoresis (PAGE) and high mol. wt. (HMW) glutenin proteins by PAGE in the presence of sodium dodecyl sulphate was analysed. The amount of protein in each gliadin band was estimated from densitometer scans, and presence or absence of particular glutenin subunits was recorded. Simple correlations were calculated among individual gliadin bands, Payne glutenin score, and each of 5 quality parameters: mixing time, mixing tolerance, water absorption, loaf vol., and crumb grainscore. Five gliadin bands were correlated with loaf vol., 2 with crumb grain score, 12 each with mixing time and mixing tolerance, and 6 with water absorption. No correlations were detected between protein concn. and presence of any particular gliadin or glutenin proteins. Payne score was significantly correlated only with loaf vol. and mixing time. Significant correlations were found between protein concn. and both loaf vol. and absorption and between mixing tolerance and crumb grain score. No associations were found between total protein content and mixing properties. Multiple regression analyses were conducted for each of the functional tests, with the individual gliadin and/or HMW glutenin bands as independent variables. Prediction of 26 - 45% of the variation in quality parameters required 8 to 11 gliadin and glutenin bands. Glutenin subunits 5 + 10 had the most consistently positive effect on most of the quality measurements. These biochemical methods can be used to identify wheat genotypes with specific HMW glutenin and gliadin composition in parental and early-generation selections, but phenotypic quality traits must be considered as well. AA

305

Symons (SJ) and Dexter (JE). **Estimation of milling efficiency: Prediction of flour refinement by the measurement of pericarp fluorescence.** *Cereal Chemistry* 69(2): 1992: 137-141

Millstreams from pilot-scale milling of commercially grown wheat representing different crop years and several Canadian wheat classes were used to evaluate the measurement of flour refinement of fluorescence imaging of pericarp tissue. Flour fluorescence was measured using a No. 09 filter combination (excitation 450 - 490 nm, emission > 520 nm specific for pericarp. Pericarp fluorescence was able to discriminate between 4 groups of divide flours (first patent, second patent, straight grade and clears) prepared from No. 1 Canada Western Red Spring (CWRS) millstreams. However, the measurements were not fully sensitive to the small variations in flour refinement among the flours within each divide flour group. The relationships of fluorescence measurements to flour ash content, grade colour and the tristimulus brightness component (L^*) for millings of Grain Research Lab. harvest survey No. 1 CWRS eastern and western prairie composites from 3 successive crop years and growing location. Comparisons of millstreams from composites of the No. 1 grade of Canada Western Red Winter, Canada Prairie Spring (red), and Canada Western Utility wheat classes showed highly significant relationships between pericarp fluorescence and flour ash, flour grade colour, and L^*. The relationships between pericarp fluorescence and the flour refinement indices for the different wheat classes were heterogenous, however, indicating that the prediction of ash content or flour colour established from millstreams obtained from one wheat class cannot be extrapolated to other wheat classes. AA

306

Huebner (FR) and Gaines (CS). **Relation between wheat kernel hardness, environment, and gliadin composition.** *Cereal Chemistry* 69(2): 1992: 148-151

Variation in wheat kernel hardness has recently increased, making wheat classification more difficult. To assess effects of growing conditions on protein composition and hardness, wheat grown in a greenhouse and commercial field-grown wheats were examined. Mature kernels from greenhouse plants were harvested and segregated according to origin from wheat heads. Individual kernels were tested for hardness with a particle size analyzer, and gliadins were extracted and analyzed by HPLC. Chromatograms were integrated, and amounts of fractions varying in hydrophobicity were determined. For greenhouse-grown wheats, hardness correlated with at least one gliadin fraction but not with original head positions of kernels. This also was true for commercial wheats, but such samples also varied in hardness due to multiple genotypes. Thus, differences in hardness among single kernels of the cv may result from variation in protein synthesis in kernels from different head locations, from variation between heads of the same plant that develop at different dates, and from multiple biotypes within cvs. AA

307

Malouf (RB), Lin (WDA) and Hoseney (RC). **Wheat hardness. II. Effect of starch granule protein on endosperm tensile strength.** *Cereal Chemistry* 69(2): 1992: 169-173

A hard and a soft wheat flour were fractionated into starch, gluten, and water solubles. These fractions were interchanged and reconstituted into doughs, which were dried and ground. Tablets made from these reconstituted flours had low tensile strength when the starch fraction was from the soft wheat, regardless of the source of the other 2 fractions. Tablets had intermediate tensile strength when made with soft wheat gluten and the hard wheat fraction. Proteins, including the 15-kDa sodium dodecyl sulphate-polyacrylamide gel gel electrophoresis band, were removed from the soft wheat starch fraction by using either proornase or sodium dodecyl sulphate. These treatments did not gelatinize the starch. The starch fraction from soft wheat with the surface protein removed-gave tablets with high tensile strength. These results support the hypothesis that the 15-kDa protein associated with soft wheat starch granules has a dominant influence on wheat endosperm texture. Pronase treatment removed essentially all protein from the starch fractions, suggesting that nearly all proteins associated with starch granules are on the surface. AA

308

Van Lonkhuijsen (HJ), Hamer (RJ) and Schreuder (C). **Influence of specific gliadins on the breadmaking quality of wheat.** *Cereal Chemistry* 69(2): 1992: 174-177

Thirty-two wheat samples with the same high mol. wt. (HMW) glutenin-A subunit composition but different gliadin compositions varied greatly in breadmaking quality. Loaf vol. ranged from 4,450 to 6,160 ml/kg of flour. Variation in the relative composition of 4 gliadin peaks, as identified and quantified by reversed phase HPLC, explained 82% of this variation. Multiple linear regression coeff. corresponding to 3 of these peaks (4, 10 and 33) were negative. Lactate polyacrylamide gel electrophoresis (lactate-PAGE) analysis revealed that these peaks contain gliadins migrating in the ω-gliadin region. The coeff. of peak 70, which contains gliadins migrating on lactate-PAGE in the γ-gliadin region, was positive. These results show that gliadins, as well as HMW glutenins, can strongly influence breadmaking properties of wheat. AA

309

White (NDG), Jayas (DS), Mills (JT) and Dronzek (BL). **Effects of canola oil or white mineral oil at dust suppressant levels on the storage characteristics of wheat.** *Cereal Chemistry* 69(2): 1992: 182-187

The storability of wheat, treated with canola oil or white mineral oil at levels used for dust suppression, was studied in the lab. Oils were applied at 100, 200, 400, 600 and 1,000 p.p.m., and treated and untreated wheat samples were stored for up to one yr at 2.5, 10, 20, 30 and 40°C. Moisture content of wheat was unaffected by all oil concn. but was lower at the higher temp. Dry grain did not produce moldy or rancid odours after one yr, but wheat at 15 - 18.6% moisture content and 2.5°C produced odour regardless of oil treatment. Fat acidity values (FAV) for the wheat were unaffected by mineral oil after one yr, but canola oil initially caused an increase of 6-7% in FAV, from values of 14.5 mg of KOH per 100 g of dry seed, for every 100 p.p.m. of oil. Although germination tended to be lower at higher oil treatment levels, differences generally were not significant. Microfloral associations with seeds were not clearly affected by any oil treatment. The reproduction of 5 female and 5 male *Tribolium castaneum* or *Cryptolestes ferrugineus* was unaffected by canola oil at 100 - 1,000 p.p.m. in 8 wks. Mineral oil had no effect on *T. castaneum*, but it decreased *C. ferrugineus* offspring by 50% at 1,000 p.p.m. Degradation of the insecticides malathion or chlorpyrifos-methyl on wheat with 200 or 600 p.p.m. of mineral oil, stored at varying ambient temp. (30 to -20°C) or 20°C, was largely unaffected by the oils after one yr. AA

310

Wu (VY) and Stringfellow (AC). **Air classification of flours from wheats with varying hardness: Protein shifts.** *Cereal Chemistry* 69(2): 1992: 188-191

Air classification of wheat flour (6 hard red winter [HRW], 4 hard red spring [HRS], and 4 soft wheats [SW]) produced an ultrafine fraction with a protein content of 38-54% (N x 5.7, dry basis) in 0.3 - 1.5% yield and a fine fraction (< 15 µm) with protein content of 21 - 30% in 11 - 25% yield. Brule, a HRW wheat with both hard and semihard kernels, produced a < 15-µm fraction with the highest protein content (30%) and yield (16%) of all HRW wheats studied. The ultrafine and < 15-µm fractions may have commercial potential as a protein concentrate. HRS wheat, HRW wheat, and SW classes differed in protein content of the 24- to 30-µm fraction, protein shift, and ratio of protien content of the < 15-µm or 24- to 30-µm fractions to protein content of the flour. AA

311

Biliaderis (CG), Izydorczyk (MS), Lukow (OM) and Bushuk (W). **Pentosans in flours of 1B/1R translocation wheats.** *Cereal Chemistry* 69(2): 1992: 226-228

Wheat flour

312

Gupta (RB), Batey (IL) and MacRitchie (F). **Relationships between protein composition and functional properties of wheat flours.** *Cereal Chemistry* 69(2): 1992: 125-131

Relationships between protein composition (measured by size-exclusion HPLC of sonicated flour suspensions in sodium dodecyl sulphate-buffer sol.) and various flour quality parameters were investigated for a set of 15 hexaploid wheat cvs grown at 6 different N fertilizer levels. As the flour protein content increased the proportion of glutenin (peak 1) remained constant, the proportion of gliadin (peak 2) increased, and the proportion of albumin-globulin (peak 3) decreased. Only the glutenin measurements (i.e., the percentage of glutenin in the protein, PG, and the % of glutenin in flour, FG) showed consistent relationships with different quality parameters. Flour quality parameters depended in different ways on these two measurements. Extensigraph extensibility, farinograph dough development time, and loaf vol. in a long fermentation baking test correlated better with FG than with PG, accounting for 68 - 80% of the variation in these parameters. These correlations were higher than those with flour protein, indicating that the long-established relationships between these quality parameters and flour protein may reflect more fundamental relationships with flour glutenin. Other quality parameters (extensigraph resistance, mixograph dough development time, loaf volume in a rapid baking test) correlated better with the PG and thus appeared to depend on the balance between polymeric and monomeric proteins. However, less of the variation (38 - 56%) could be ascribed to PG. Evidence was obtained that an additional contribution to the variation in the latter parameters originated in the glutenin subunit composition, in particular, in the balance between the high and low mol. wt. subunits. AA

313

Shelke (K), Hoseney (RC), Faubion (JM) and Curran (SP). **Age-related changes in the cake-baking**

quality of flour milled from freshly harvested soft wheat. *Cereal Chemistry* 69(2); 1992; 141-144

The milling and cake-baking quality of freshly harvested soft red winter wheat composites from 2 crop yrs over 16-wk period after harvest was monitored. In both yrs, composites of 3 var. were milled biweekly, and a portion of the flour was chlorinated immediately after milling. The quality of white layer cakes produced from the untreated and chlorinated flours was assessed over a 2-wk period following each milling. Flour particle size analyses indicated that the kernels did not become harder with time after harvest. Regardless of chlorination, freshly milled flours produced batters with high sp. gr. Batter sp. gr. decreased greatly during the first 2 days after milling and continued to fall thereafter at a lower rate. Immediately after milling, all flours (regardless of chlorine treatment) produced collapsed cakes. The cake-baking quality of the flours improved with both wheat and flour age. Flour milled from freshly harvested soft wheat changed rapidly in the time immediately after milling. The rate of postmilling changes slowed as a function of prior wheat storage time. Chlorine treatment improved cake-baking quality and dampened but did not prevent the observed postmilling fluctuations in quality. AA

314

Shelke (K), Hoseney (RC), Faubion (JM) and Curran (SP). **Age-related changes in the properties of batters made from flour milled from freshly harvested soft wheat.** *Cereal Chemistry* 69(2); 1992; 145-147

A consistent pattern of age-related changes in the properties of wheat and flour over 2 consecutive crop yrs was noted. The on set temp. of starch gelatinization in wheat endosperm increased slightly as a function of postharvest time. Freshly milled flours had low distilled water binding capacity (DWBC) and produced batters of low viscosity at ambient temp. and during heating. DWBC of flours, both untreated and chlorinated, was lowest immediately after milling, increased during the first wk, and changed little after that. The time required to reach the max. DWBC value decreased as wheat age increased. Batter viscosity at ambient temp. and min. viscosity during heating both increased as a function of flour age. DWBC was strongly correlated with cake-baking quality of flours milled from freshly harvested wheats. AA

315

Malouf (RB) and Hoseney (RC). **Wheat hardness. I. A method to measure endosperm tensile strength using tablets made from wheat flour.** *Cereal Chemistry* 69(2); 1992; 164-168

To obtain a direct measure of tensile strength of reconstituted endosperm from common wheat (*Triticum aestivum* L.), tablets were made by compressing flour that contained 28% moisture. Those tablets were then dried under controlled RH. Dried tablets were fractured in diametral compression to measure tensile strength. As expected, tablets made from hard wheat flour had greater tensile strength than those made from soft wheat flour. In tablets made from hard or soft wheat flours, contact between starch granules and the surrounding protein phase was visually similar to that of typical hard or soft wheat endosperms. A hard and a soft wheat flour were fractionated into starch, gluten and water solubles. These fractions were reconstituted into doughs, which were dried and ground. Tablets made from these reconstituted flours had tensile strength similar to that of tablets made from the parent flours. Factors influencing tablet tensile strength remained active through the processes of storage, milling, fractionation, reconstitution, and tablet making. AA

MILLETS

Corn

316

Snehalatha Reddy (N), Kamble (RM) and Khan (TNI). **Evaluation of nutritional quality of maize and maize products.** *Indian Journal of Nutrition and Dietetics* 28(3); 1991; 90-94

Nutritional evaluation for maize (*Zea mays*), (i) Maize *roti*, (ii) popped maize and (iii) maize flakes is reported. Total P, crude protein, non-protein nitrogen, total Fe, ionisable Fe were determined. Crude protein was more in maize kernels (9.43 g %) than in *roti* (8.76 g %) popped maize (7.76 g %) and flakes (6.90 g %). Non-protein nitrogen (g %) was 0.234 in (i), 0.34 in (ii) and 0.3 in (iii) and 0.194 in kernels. Total P content in was 242 mg in (i), 207 mg in (ii), 205 mg in (iii) and 0.251 in maize kernels. Total Fe content in (i), (ii) and (iii) was 2, 1.90 and 1.93 mg % respectively and it was 2.13% in kernels. The ionisable Fe contnet (mg%) was 0.133 in (i), 0.187 in (ii), 0.153 in (iii) and 0.12 in kernels. Bioavailability of Fe was max. in popped maize and min. in maize kernels and it showed significant negative correlation with phytate P, tannin and acid detergent fibre. Digestibility of maize proteins was significantly lower than that from their products. A negative correlation was observed between the protein digestibility and phytate P, tannin and acid detergent fibre. GS

317

Esuoso (KO), Oderinde (RA) and Okogun (JI). **Citric acid production from imumu *Cyperus esculentus* and maize *Zea mays*.** *Journal of Fermentation Technology (Hakko Kogaku Zasshi)* 71(3): 1991: 200-202

The production of citric acid from imumu and maize was carried out using *Aspergillus niger*. Hydrolysis of the substrates at 97°C produced a higher concn. of reducing sugars than at 40°C. The concn. of citric acid were hgiher in unagitated and defatted cultures compared to agitated and undefatted cultures respectively. AA

318

Beaver (RW), James (MA) and Lin (TY). **Comparison of and ELISA-based screening test with liquid chromatography for the determination of aflatoxins in corn.** *Journal of the Association of Official Analytical Chemists* 74(5): 1991: 827-829

An enzyme-linked immunosorbent assay (ELISA) screening test (CITE PROBE) was compared to liquid chromatography (LC) for the detn. of aflatoxins in naturally contaminated corn samples. The CITE PROBE, with a positive/negative cutoff of 5 ng/g aflatoxin B_1, was correct (based on LC results) on 47 of 51 samples. Two of the incorrect responses by the CITE PROBE were false positives on samples containing 4.1 ng/g aflatoxins by LC. Another incorrect response was a false negative on a sample containing 5.5 ng/g aflatoxins by LC. The fourth incorrect response was a false positive on a sample containing 1.9 ng/g aflatoxins by LC. On the basis of these results, the CITE PROBE was determined to be a reliable screeing method for the detection of greater than or equal to 5 ng/g aflatoxins in corn. AA

319

Fox (SR), Johnson (LA), Hurburgh (CRJr), Dorsey-Redding (C) and Bialey (TB). **Relations of grain proximate composition and physical properties to wet-milling characteristics of maize.** *Cereal Chemistry* 69(2): 1992: 191-197

The relations of proximate compositions and physical properties of 27 maize hybrids to lab.wet-milling characteristics were determined. No single trait accounted for more than 40% of the variation (r^2) in starch yield or more than 60% of the variation in protein content of the recovered starch. Merely having higher starch content in the kernel did not increase starch yields (r = 0.20). Hybrids with lower protein contents (r = -0.63) and higher 1,000-grain wts (r = 0.43) yielded more starch, whereas hybrids with higher protein contents (r = 0.77) and harder endosperms (r = 0.58) gave higher residual protein contents of recovered starch. The best models for predicting starch yields included grain protein content and any one of the following: test wt., absolute density, kernel hardness (Stenvert sample height), or water absorptivity (index or initial rate). The preferred model for starch yield (percentage of starch yield = 58.2 - 3.6 [percentage grain protein] + 0.5 [test wt.]) accounted for 61% of the variation. Protein content in starch was a function of grain protein and oil contents. The preferred model for protein content of recovered starch (percentage of protein in starch = -1.28 + 0.23 [percentage grain protein] + 0.13 [percentage grain oil]) accounted for 66% of the observed variation. AA

Corn bran

320

Mistry (AH) and Eckhoff (SR). **Alkali debranning of corn to obtain corn bran.** *Cereal Chemistry* 69(2): 1992: 202-205

An alkali-debranning process was developed for yellow dent corn to obtain corn bran without disintegrating or splitting the kernel. NaOH was found to be the most effective alkali for loosening the pericarp of the kernel and subsequently separating it in a hydroabrasor, leaving the kernel absolutely free of pericarp. The pericarp obtained was dried and expressed as bran yield on a corn dry-solids basis. Three variables significantly affecting bran yield were alkali concn. from 4 to 10%, treatment time from 5 to 12 min, and treatment temp. from 46 to 68°C. A max. bran yield of 4.68% on dry-corn basis (standard deviation = 0.014%) occurred at 6% alkali concn, 9-min treatment time, and 57°C. Corn bran contained 92.1% dietary fiber, which constituted 95.5% of the total dietary fiber present in the pericarp. Corn drying temp. and endosperm hardness had no significant effect on the bran yield. The bran obtained by the alkali-debranning process was more purified than the commercial corn brans produced by wet-and dry-milling processes. AA

Corn chips

321

Achoba (II), Elegbede (JA), Agbaji (AS) and Agbaji (EB). **Moisture isotherms of corn chips at three temperatures.** *International Journal of Food Science and Technology* 26(5): 1991: 547-552

The moisture sorption isotherms of corn chips at 3 ambient temp. (27, 35 and 40°C) were sigmoidal, a function of temp. and described by the Henderson equation. Storage stability of the product would be enhanced below 27°C and 3.4 moisture content dry basis (d.b.). The isosteric heats of sorption were calculated. AA

Sorghum

Sorghum flour

322

Rom (DL), Shull (JM), Chandrashekar (A) and Kirleis (AW). **Effects of cooking and treatment with sodium bisulphite on *in vitro* protein digestibility and microstructure of sorghum flour.** *Cereal Chemistry* 69(2): 1992: 178-181

The predominant indigestible proteins in cooked sorghum are kafirins, which are stored in protein bodies. *In vitro* pepsin digestion assay and scanning electron microscopy were used to examine the effects of cooking and treatment with sodium bisulphite on protein digestibility and protein body microstructure. *In vitro* pepsin digestion assay showed that sorghum decreases in protein digestibility after cooking. Treatment with sodium bisulphite increased the digestibilities of both cooked and uncooked flour. Scanning electron micrographs revealed that in all treatments the protein matrix is digested before the protein bodies. Protein bodies in uncooked samples were digested by pitting from the outer surface. In contrast, the protein bodies from the cooked sorghum did not exhibit any pitting. They became ellipsoidal. Cooking changed the protein bodies so that they could not be digested as they had before cooking. Protein bodies in cooked samples that had been soaked in sodium bisulphite did exhibit shallow pits, suggesting a reversal in the reactions that took place during cooking. Since sodium bisulphite prevents the formation of disulphide bonds during cooking and makes the sorghum more pepsin-digestible, formation of disulphide bonds is probably responsible for reduced protein digestibility in cooked sorghum. AA

PULSES

323

Rajaram (N) and Janardhanan (K). **Studies on the underexploited tree pulses, *Acacia catechu* Willd., *Parkinsonia aculeata* L. and *Prosopis chilensis* (Molina) Stunz: Chemical composition and antinutritional factors.** *Food Chemistry* 42(3): 1991: 265-273

Prosopis chilensis contained higher crude protein and crude lipid than common pulses. All the 3 pulses were rich in K, Ca, Mg and Fe, being distinctly deficient in sulpho-amino acids, cystine and methionine. *P. aculeata* and *P. chilensis* having albumins and glutelins as the major seed protein, the former was deficient in sulpho-amino acids, cystine and methionine and the latter in threonine and trysine + phenylalanine. Antinutritional factors - total free phenols, tannins, L-DOPA, haemagglutinating activity and trypsin inhibitor activity were reported. SD

Chickpeas

324

Narpinder Singh, Sekhon (KS), Usha Bajwa and Shyama Gopal. **Cooking and parching characteristics of chickpea (*Cicer arietinum* L.).** *Journal of Food Science and Technology (India)* 29(6): 1992: 347-350

Five improved and a local var. of chickpea were evaluated for their physical, chemical, hydrating, cooking and parching characteristics. 'PBG-1' var. had the lowest seed wt., seed vol. and hydrating properties; but required the highest force for breaking and crushing. The var. 'PGB-1' and 'GL-769', after 60 min of cooking, indicated low cooked kernel yield, solid losses, lower overall acceptability and were rated poor for cooking. These var. had poor puffing properties, while the local var. was found to be the best for puffing purposes. AA

Cowpeas

325

Bittenbender (HC). **Handling and storage of cowpea *Vigna unguiculata* (L.) Walp. as a leaf vegetable.** *Tropical Agriculture* 69(2): 1992: 197-199

Cowpea cv 'Vita 7' leaves packed in a closed 2 mil polythene bag and stored at 15°C for 6 days were edible. Irrespective of storage temp. and package ventilation, the edible leaves retained a moisture content similar to that of freshly harvested leaves. BV

326

Bakr (AA) and Gawish (RA). **Nutritional and cooking quality evaluation of dry cowpea (*Vigna sinensis* L.) grown under different agricultural conditions. 2. Effect of soaking and cooking processes on the physical, nutritional .and sensory characteristics of cooked seeds.** *Journal of Food Science and Technology (India)* 29(6): 1992: 375-380

Cooking time, vol. and firmness of cooked cowpeas were not affected by foliar application of plants with gibberellic acid, cycocel and white wash under non-saline conditions. Salinization increased cooking time and decreased vol. and firmness of cooked seeds. Soaking in water for 12 h before cooking, decreased cooking time and firmness, but increased vol. of cooked seeds, whereas the effect of soaking in hot water was more pronounced. Rate of water imbibition during cooking of dry and soaked seeds was linear to cooking time. Soaked seeds in distilled water gave the highest wt. at any time of cooking. More solids were leached out due to cooking in 2% NaCl sol. compared to cooking in plain water subsequent to hot water soaking for 12 h. Soaking in hot water before cooking retained more nutritional components. Soaking in hot water improved markedly the sensory properties particularly appearance, texture, colour and reduced the beany flavour. AA

Mucuna pruriens

327

Josephine (RM) and Janardhanan (K). **Studies on chemical composition and antinutritional factors in three germ plasm seed materials of the tribal pulse, *Mucuna pruriens* (L.) DC.** *Food Chemistry* 43(1): 1992: 13-18

Three germ plasm seed materials of the Indian tribal pulse collected from different agroclimatic regions contained albumin and globulin as the major bulk; higher crude protein and lipid; and rich in minerals (, Mg and P). All the anti-nutritional factors except L-DOPA detected can be eliminated by cooking. Also the globulins showed weak agglutination with erythocytes. The germ plasms from silent valley and Lucknow were rich in threonine and that from Begur in Fe. SD

Mung beans

Mung bean starch

328

Oates (CG). **Studies on mung bean starch: Granule stability.** *Food Hydrocolloids* 4(5): 1991: 365-377

Physicochemical measurements confirm that mung bean starch exhibits restricted swelling and high granular stability. The effect of a non-specific protease upon the fractionation and type of product obtained after hydrolysis with amylases was investigated. Successful fractionation was achievable only after treatment with the protease. Limited debranching and reduced β-amylase activity was shown: such phenomena are typical of cross-bonded starch. Further study using proteolytic enzymes suggests that the amylopectin fraction of mung bean starch is stabilized by the presence of peptide cross-links. Electrophoresis indicated the presence of 2 major polypeptides of low mol. wt. associated with the amylopectin fraction. AA

Pigeonpeas

329

Singh (U), Santosa (BAS) and Rao (PV). **Effect of dehulling methods and physical characteristics of grains on *Dhal* yield of pigeonpea (*Cajanus cajan* L.) genotype.** *Journal of Food Science and Technology (India)* 29(6): 1992: 350-353

Two traditional methods of dehulling - manual and home-processing (stone *chakki*); and 2 lab. methods - barley pearler and tangential abrasive dehulling device (TADD)) - were employed to study the dehulling quality of 8 pigeonpea genotypes. *Dhal* yield by TADD was the highest (80.0%) for 'ICPL 87052' and the lowest (54.1%) for 'ICPL 87049' indicating significant ($P < 0.01$) differences among genotypes. These results were further substantiated by the *dhal* yield values obtained by barley pearler. The stone *chakki* gave highly variable and erroneous results on *dhal* yield. The TADD and barley pearler methods were comparable and reliable. The theoretical *dhal* yield (manual method) was not correlated with dhal yields obtained by stone *chakki*, barley pearler and TADD. Grain hardness and grain vol. were negatively correlated with the *dhal* yields obtained by the TADD and barley pearler methods, whereas swelling capacity and grain flotation values were not correlated with *dhal* yields obtained by these methods. AA

OILSEEDS AND NUTS

Canola

330

Kermasha (S), Khalyfa (A), Alli (I) and Lee (B). **Purification and characterization of lipoxygenase isozymes from canola (*Brassica napus* cv, Westar) seed.** *Journal of Food Biochemistry* 15(3): 1991: 219-238

Cottonseeds

331

Kulkarni (AS), Khotpal (RR), Shingwekar (PB) and Bhakare (HA). **Glycolipid composition of some seed varieties of cotton.** *Journal of Food Science and Technology (India)* 29(6): 1992: 366-368

Glycolipids, from 6 var. of cottonseeds showed the prominence of diglucosyl and monoglucosyl diglycerides which accounted for 62 - 71% in addition to the presence of steryl glucoside (SG), acylated steryl glucoside (ASG) and an unidentified component. The fatty acid composition of total and component glycolipids showed the presence of myristic, palmitic, oleic, stearic, linoleic acids as major acids. Glucose was identified as a sugar moiety. The ratio of sugar-sterol-fatty acid was nearly 1:1:1 in ASG and that of sugar-sterol was nearly 1:1 in SG. AA

Sarson

332

Berry (SK) and Sehgal (RC). **Physical and chemical characteristics of Chinese Sarson (*Brassica chinensis*) seeds and oil.** *Journal of Food Science and Technology (India)* 29(6); 1992; 391-392

Comparison of physical and chemical characteristics of Chinese sarson (*Brassica chinensis*) seeds and oil with other mustard var. indicated that the Chinese sarson seeds are low in oil but high in protein content. Sp. gr. and saponification value of Chinese sarson oil are slightly higher compared to other Brassicae seed oils. Oil contains more erucic acid and less linolenic acid than other var. AA

Sesame

333

Jagannatham (A), Srinivasa (P), Reddy (SG) and Soundararajan (MS). **Effect of foliar application of growth regulators and nutrients on Sesamum.** *Andhra Agricultural Journal* 37(4); 1990; 398-399

Sesamum (*Sesamum indica*) plants were sprayed with 1% urea, 1% diammonium phosphate (DAP), 2.5 p.p.m. triacontanol, 50 p.p.m. napthalene acetic acid, 0.5% $ZnSO_4$, 5% $FeSO_4$, 0.5% micronutrients separately and with their combinations. Foliar treatments were given at 500 l/ha and 800 l.ha at 25 and for 40 days after sowing respectively. Grain yield was higher with $ZnSO_4$ (718 Kg/ha) and with micronutrients (713 Kg/ha) than the control (635 Kg/ha). Oil content did not increase by any treatment and was not better than the control. KAR

Sesame products

Tehina

334

Lindner (P) and Kinsella (JE). **Study of the hydration process in *tehina*.** *Food Chemistry* 42(3); 1991; 301-319

The hydration transforms *tehina* (sesame butter) from a suspension of hydrophilic insoluble solids in anhydrous state to an oil-in-water emulsion (solids become dispersed when the water exceeds 30%), significantly increases viscosity upon addition of small amounts of water (< 12%) followed by oil-separation from the hydrated solids at 24 - 30% water content. The oil-water emulsion is stabilized by adsorption of swollen insoluble solids onto interfacial film around the oil droplets. Process did not alter solubility of meal protein, change the amino acid composition nor the electrophoretic pattern of subunits of the salt-soluble α-globulin fraction whose mode of aggregation changed to form units of half the mol. wt. reported for sesame globulins. SD

Soybeans

335

Sakai (N) and Yonekawa (S). **Three-dimensional image analysis of the shape of soybean seed.** *Journal of Food Engineering* 15(3); 1991; 221-234

An apparatus for 3-dimensional (3-D) measurement with a structured light system was made to study the shape of soybean seed; its axial length, surface area, vol., particle density, compactness and sphericity were measured. From the analysis on a reduced sample of the seed population, the typical size and shape of seed were calculated. The 3-D properties of surface area and vol. were expressed as functions of seed mass. In general, soybean seed appears to be uniform in shape over a wide range of sizes. AA

Soy products

Poshak

336

Neerja (A), Joshi (KC), Gandhi (AP) and Sinha (LK). **Studies on the preparation of *poshak*: a soybased supplementation food.** *Indian Journal of Nutrition and Dietetics* 28(3); 1991; 78-81

Bengal gram, roasted wheat and blanched soybeans were ground in a domestic Burr mill and mixed in the 4:2:1 ratio. This supplementation food called '*Poshak*' was fried in fat. Sugar syrup with 1/3 consistency and powdered cardamom were added and laddu was prepared. It was observed *Poshak* is comparable to commercial supplementary foods like *Cerelac* and *Farex*. Fat content in *Poshak* is higher (7.8%) than *Farex* (7.5%); but protein content is higher in *Poshak* (19.0%). Blanching of soybean eliminates the antinutritional factors. *Poshak* is very cheap (Rs. 9.00 for 500 g) and can be prepared at homes with simple appliances. GS

Snacks

337

Das (HK). **Crisp and spicy soybean snack.** *Journal of Food Science and Technology (India)* 29(6); 1992; 387-389

Use of soybeans as snack food of the type exemplified by roasted peanuts was explored by roasting hydrated beans, hull removal and splitting. The product had a crunchy texture, mild nutty flavour and was devoid of urease activity. Shelf-life of the unspiced product was 4 months in ordinary storage and one yr in air-tight containers. AA

Soy milk

338

Rasyid (F) and Hansen (PMT). **Stabilization of soy milk fortified with calcium gluconate.** *Food Hydrocolloids* 4(5); 1991; 415-422

High-calcium soy milk was prepared by adding Ca gluconate as a Ca source, sodium hexametaphosphate (SHMP) as a sequestering agent, and calcium-D-saccharic acid as a stabilizing agent, so that the Ca content of soy milk was increased to the same or higher levels than that of bovine milk. It was demonstrated that the addition of these substances resulted in a soy milk with a high content of Ca and satisfactory heat stability of the final beverage. SHMP and calcium-D-saccharic acid were shown to be effective for reduction of the Ca ion activity of the soy milk. The findings suggest that there is a synergistic effect between the sequestering agent and the stabilizing agent. AA

Soy proteins

339

Mouecoucou (J), Villaume (C), Bau (HM), Nicolas (JP), Mejean (L), Schwertz (A). **Effects of soybean protein diets supplemented with different levels of sodium alginate or carrageenan in rats.** *Food Hydrocolloids* 5(1/2); 1991; 45-47

Soybean meal diets with 0.5, 1, 2 and 3% alginate showed no effects on cholesterol levels in 21 day old male Wistar strain rats but the effect on triglyceride level required to be confirmed. Soybean meal with 0.5, 1, 2 and 3% carrageenan led to a very significant decrease in serum triglyceride level but had no effect on cholesterol levels. As the food intake were not significantly different the effects on growth and triglyceride levels could be due to insufficient intestinal absorption caused by diet viscosity. SD

340

Dahl (SR) and Villota (R). **Extrusion performance of N-propanol denatured soybean protein.** *Journal of Food Processing Preservation* 15(5); 1991; 315-330

Alcohol modified soybean flours, treated with various concn. of aqueous n-propanol and spray dried, were evaluated for texturization performance using a Werner Pfleiderer twin-screw extruder. Alcohol modification showed significant quality variation of texturized soy proteins. The high quality of extruded low solubility alcohol-modified soy flour at high feed rates may be due to renaturation mechanisms. The microstructural features of dried alcohol-modified products examined by SEM correspond to other extrudate properties. SD

TUBERS AND VEGETABLES

Potatoes

341

Gonzalez (JM), Lindamood (JB) and Desai (N). **Recovery of protein from potato plant waste effluents by complexation with carboxymethylcellulose.** *Food Hydrocolloids* 4(5); 1991; 355-363

The processing of potato products from fresh potatoes produces waste effluent containing substantial amounts of protein. In this study, the recovery of a protein-hydrocolloid complex from a simulated potato processing plant waste effluent (SPWE), using carboxymethylcellulose (CMC) as the complexing agent, was investigated. The effects of CMC to protein ratio (CPR), pH, temp. and type of CMC with respect to degree of substitution (DS) on complex formation and protein recovery were studied. Optimum results were obtained using CMC DS 0.85 - 0.95, CPR of 0.05, and pH 1.5 - 4.0. The temp. of precipitation had little effect in the range of 4 - 25°C. The recovered complex contained 76.6% protein, 17.6% CMC and formed a bulky precipitate easily separated from the SPWE. AA

Vegetables

342

Prabhakar (E), Backyavathy (DM) and Nandakumar (NV). **Seasonal analysis of pesticide residues by HPLC in some vegetables of Tirupati.** *Andhra Agricultural Journal* 37(4); 1990; 390-392

Residues of BHC, DDT, fenitrothion, methyl parathion, and carbamate were determined by HPLC in 96 tomato (*Lycopersicon esculentum*) and Lady's finger (*Hibiscus esculentus*) samples. 52% of the samples contained 0.036 to 6.900 p.p.m. of BHC and fenitrothion was 0.083 to 38.9 p.p.m. in both the vegetables. Methyl parathion, and carboryl (carbamate) residues were relatively low. KAR

343

El Ghaouth (A), Arul (J), Ponnampalam (R) and Boulet (M). **Use of chitosan coating to reduce water loss and maintain quality of cucumber and bell pepper fruits.** *Journal of Food Processing Preservation* 15(5): 1991: 359-368

Cucumber and bell pepper coated with chitosan (1 and 1.5% w/v) stored at 13 and 20°C (RH 85%) reduced respiration rate, loss of colour, wilting and fungal infection and delayed senescence due to its ability to alleviate water stress. Increased concn. of chitosan (1.5% w/v), resulted in significantly greater wt. retention. SD

344

Kochar (G), Kumar (RS) and Singh (B). **Glucosinolate contents of commonly grown and consumed vegetables of Himachal Pradesh.** *Journal of Food Science and Technology (India)* 29(6): 1992: 396-397

On fresh matter basis, high glucosinolates were found in mustard seeds (3.1%) and mustard leaves (2.7%) followed by fenugreek leaves (1.9%). The values for cauliflower, turnip, cabbage and knol-khol were 1.7, 1.2, 0.7 and 0.6%, respectively. When expressed on dry matter basis, the glucosinolate contents were highest in mustard leaves (26.3%) followed by cauliflower (18.2%) but lowest in knol-khol (8.7%) and cabbage (8.3%). AA

Brinjals

345

Bhupal Reddy (T), Balasubramaniam (KA) and Suryanarayana (V). **Studies on fungicide residues in brinjal fruits.** *Andhra Agricultural Journal* 37(4): 1990: 393-395

Brinjal (*Solanum melongena*) plants were sprayed (4 sprayings) with Dithane in 1979-80 and 1980-81 separately. M-45 (0.25% concn.) and dithane Z-78 (0.5% concn.) with 10 days intervals between sprayings (4 sprayings); last spray was 20 days before harvest. Residue was highest, in the first yr at spray concn. of 0.5% with both the fungicides. At 0.25% concn. the residue was significantly low. In the 2nd yr recovery of Dithane M-45 residue was higher than in the 1st yr at 0.5% concn. At 0.25% level, the recovery was low. Degradation of fungicides was noticed only at 20 days after spraying, during both the yr. Fruits with calyx retained more residue than those without calyx. GS

Broccoli

346

Logomarsino (JV) and Jin Gao. **Ascorbic acid retention of broccoli held on a refrigerated salad bar.** *Journal of Food Quality* 14(6): 1991: 513-519

Raw broccoli florets held at 13 plus or minus 2°C and 22 plus or minus 2°C locations from the cooling source of a commercial salad bar unit for 8 h, refrigerated for 16 h and returned to the unit for 2 h were analysed at 0, 2, 4, 8, 24 and 26 h for reduced ascorbic acid (RAA). RAA significantly decreased in 22°C, the values being 94.8 plus or minus 3.2% at 13°C and 88.9 plus or minus 7.1% at 22°C. There was no significant treatment differences in moisture content. SD

Leafy vegetables

Amaranthus

347

Ologunde (MO), Shepard (RL), Afolabi (OA) and Oke (OL). **Bioavailability of iron to rats from fortified grain amaranth flour.** *International Journal of Food Science and Technology* 26(5): 1991: 493-500

In this study, fortified and unfortified grain amaranth seed flour and $FeSO_4$ fortified casein diet as control were evaluated for their Fe bioavailability. NaFeEDTA ferrous fumarate, and $FeSO_4$-fortified grain amaranth were fed to Sprague Dawley weanling male rats. Fe intake Hb Fe gain, Fe availability and binding capacity, serum Fe, non-haem liver Fe and relative biological value (RBV) were determined and values compared with $FeSO_4$-fortified casein control; all were improved greatly by fortification. Relative biological values (RBV) were 0.40, 1.55, 1.75, 1.67 and 1.00 for animals receiving unfortified amaranth diet, those fed diet fortified with NaFeEDTA, ferrous fumarate, $FeSO_4$ and casein fortified with $FeSO_4$ respectively. RBV of the unfortified cereal was 40% of control suggesting perhaps low Fe absorption form the amaranth cereal. Based on the results of this study, amaranth cereal is ideal as a food vehicle for Fe fortification. The Fe fortificant of choice is ferrous fumarate. AA

348

Ologunde (MO), Akinyemiju (AO), Adewusi (SRA), Afolabi (OA), Shepard (RL), Oke (OL). **Chemical evaluation of exotic grain amaranth seed planted**

in the humid lowlands of West Africa. *Tropical Agriculture* 69(2): 1992; 106-110

Chemical and nutrient properties of 3 var. *Amaranthus caudatus*, *A. hybridus* and *A. hypochondriacus* were in the range: protein 18.2 plus or minus 1.2%; carbohydrate 65.2 plus or minus 2.4%; crude fat 5.7 plus or minus 0.7% and total dietary fibre 19.6 plus or minus 5.7% all comparable to those of the parent stock. Nutritive macrominerals, K, Mg, Ca, microminerals, Cu, Fe, Zn, essential amino acids, lysine (4.8 g/16 g N) and sulphur containing amino acids (3.8 g/16 g N) were high. Phytate (5.90 - 23.50 mg phytate g^{-1} defatted meal) and tannins (0.03 - 1.12%) were of comparable levels with other grains. The lipid fraction was very rich in unsaturated fatty acids (76.2 plus or minus 1.6%). SD

349

Sushma Sawhney and Shobhana Bhide. **Isolation of a lectin from *Amaranthus paniculatus* seeds.** *Journal of Food Science and Technology (India)* 29(6): 1992; 354-356

A N-acetyl-α-D-galactosamine specific lectin from the seeds of *Amaranthus paniculatus* was purified to homogeneity by affinity chromatography on immobilized desialyated porcine gastric mucin and found to be a homo dimer and a glycoprotein (10.5% carbohydrate w/w) with mol. wt. of the subunit being 27,000 (plus or minus 1410). Its amino acid composition revealed high contents of váline, leucine, and acidic amino acid residues. This lectin also had high contents of methionine, tryptophan and lysine. *A. paniculatus* lectin agglutinated normal and papain-treated rabbit and human A, B and O erythrocytes. AA

Plantains

Plantain flour

350

Ukhun (ME) and Ukpebor (IE). **Production of instant plantain flour, sensory evaluation and physico-chemical changes during storage.** *Food Chemistry* 42(3): 1991; 287-299

Instant plantain flours from ripe and unripe plantain fingers prepared by cooking, oven dehydration at 76°C and 80 - 90°C were stored at 5 plus or minus 1°C and at 22 plus or minus 4°C. Flours from ripe plantain were more acceptable, had higher moisture, total sugar, and lower pH, ascorbic acid, Na, K, P, Ca and Fe than flours from unripe plantain. The product can be used as base for baby weaning foods, puddings, soups and gravies. SD

Tomatoes

351

Deniston (MF), Kimball (RN), Stoforos (NG) and Parkinson (KS). **Effect of steam/air mixtures on thermal processing of an induced convection-heating product (tomato concentrate) in a steritort.** *Journal of Food Process Engineering* 15(1): 1992; 49-64

The effect of reel speed, can size, and percent air during steam and steam/air processing in a Steritort on the heating rate of tomato concentrate (an induced convection-heating product) was investigated. A Taylor expansion equation, relating Ball process times with the above 3 variables, considering first order, second order, and interaction effects, was presented. A correlation equation for the Nusselt number as a function of the Reynolds and Prandtl numbers, the can length over the diam. ratio, and the steam content was also presented. Percent reduction in process lethality increased with increasing can size and air content, and decreasing reel speed and target lethality. Increase in percent air in the steam/air mixture could be compensated by an increase of the rotational speed. AA

352

Albel Singh, Singh (Y) and Sanjeev Batheja. **Suitability of packaging boxes for tomatoes.** *Journal of Food Science and Technology (India)* 29(6): 1992; 381-383

Textural properties of tomato were evaluated with different packaging conditions on vibration table under simulated transportation. The colour of tomatoes changed from greenish to pink to red. Firmness decreased and decay increased with longer duration of vibration and storage period. AA

FRUITS

353

Conte (J), El Blidi (A), Rigal (L) and Torres (L). **Ethylene removal in fruit storage rooms: A catalytic oxidation reactor at low temperature.** *Journal of Food Engineering* 15(4): 1992; 313-329

During post-harvest conservation, climacteric fruit release ethylene whose accumulation speeds maturation, senescence and degradation processes in conserved fruits. The performance of an ethylene removal reactor working by catalysis at low temp. is studied. The main factors studied are catalyst temp., ethylene concn., flow rate of air-ethylene gaseous mixture and catalyst mass. Work based on the exp. designs (uniform shell design) of Doehlert yielded a better knowledge on the influence of the different factors studied and facilitated the optimisation of the conditions of ethylene removal. The catalytic procedure used ensures a very efficient oxidation with an efficiency of 100% at a temp. between 100 and 120°C. A commercial prototype has been devised by extrapolation of the results obtained on a lab. scale. AA

354

Fourie (PC), Hansmann (CF) and Wium (GL). **Effects of fresh fruit characteristics and cold storage on the quality of dried apricots and peaches.** *Journal of Horticultural Science* 67(1): 1992: 59-65

The effects of a 2 wk cold storage period and fresh fruit characteristics on the quality of dried 'Peeka' apricots and 'Elberta' peaches were studied. The total soluble solids content of fresh apricots and peaches were both negatively correlated with the drying ratio. The ideal fresh size for production of large and extra-large dried apricots was 40 mm and larger, and for large dried peaches between 55 mm and 70 mm. Cold storage before drying had no detrimental effect on the quality of dried fruit and can be used effectively to extend the processing season. AA

355

Papadopoulou-Mourkidou (E). **Postharvest-applied agrochemicals and their residues in fresh fruits and vegetables.** *Journal of the Association of Official Analytical Chemists* 74(5): 1991: 745-765

The persistence and distribution of residues in the edible portions of fresh fruits and vegetables of post-harvest applied agrochemicals is presented in this review. The fruits reported are citrus fruits, pome fruits, stone fruits, mangoes, strawberries, bananas, kiwi fruits, avocados, some minor fruit commodities and bell pepper and tomatoes. Data on the persistance and residues of the fungicides, fumigants, insecticides, the antiscald compounds and the growth regulators are presented and discussed. 245 references. BV

356

Medlicott (AP), Semple (AJ), Thompson (AJ), Blackbourne (HR) and Thompson (AK). **Measurement of colour changes in ripening bananas and mangoes by instrumental, chemical and visual assessments.** *Tropical Agriculture* 69(2): 1992: 161-166

Mangoes (Julie cv.) were stored in sealed lid buckets with ethylene free humidified air and placed in cabinets at 20 plus or minus 1°C. Similarly bananas (Valery cv.) were first ethylene treated and stored like mangoes. TSS, pulp rupture force, colour score by visual and Hunter values upto 6 days and chlorophyll and carotenoids upto 9 days were studied. There were significant correlations between visual colour scores and Hunter values: between visual colour scores and chlorophyll but not between visual colour scores and carotenoid. In banana peel colour showed significant correlations to pulp firmness and TSS but in mango the peel colour change was delayed to the changes in pulp firmness and TSS. SD

Apples

357

Barrett (DM), Lee (CY) and Liu (FW). **Changes in the activity and subcellular distribution of PPO in 'delicious' apples during controlled atmosphere storage.** *Journal of Food Biochemistry* 15(3): 1991: 185-199

Changes in polyphenol oxidase (PPO) activity were sooner in apples stored under high CO_2 conditions (2.5 - 6% O_2, 8 - 12% CO_2) than those under normal conditions (2% O_2, 3% CO_2). GS

358

Barrett (DM), Lee (C) and Lui (FW). **Changes in 'Delicious' apple browning and softening during controlled atmosphere storage.** *Journal of Food Quality* 14(6): 1991: 443-453

'Delicious' apples stored in controlled atm. (CA) for 7 - 14 wks showed significant losses in polyphenol oxidase activity, browning tendency, firmness and electrolyte leakage (reached max. at 11.5 wks) with total phenolics remaining constant due to membrane integrity loss and decompartmentalization. The changes in these characteristics accelerate in air after removing from CA storage. SD

Bananas

359

Satyan (S), Scott (KJ) and Graham (D). **Storage of banana bunches in sealed polyethylene tubes.** *Journal of Horticultural Science* 67(2): 1992: 283-287

Bunches of banana cv. Williams were obtained on 7 occasions over a 2 yr period from Coffs Harbour, New South Wales and treated with 0.1% benomyl to reduce rotting. Treatments were randomly applied to the branches as follows: (I) no treatment, (II) sealed in a polyethylene tube (thickness 0.1 mm), (III) sealed in a polyethylene tube (thickness 0.1 mm) containing 100 g vermiculite impregnated with a saturated sol. of $KMnO_4$ to remove ethylene. The bunches were held on each occasion at either 28. 20 or 13°C. The av. storage life was increased 2 - 3 times (over control) when the bunches were held in sealed polyethylene tubes and increased 3 - 4 times when an ethylene absorbent was packed with the bunch in the polyethylene tubes. The use of the sealed polyethylene tubes and ethylene absorbent allowed a storage life of up to 6 wks at 20 - 28°C and 16 wks at 13°C. The storage life of the bunches was limited by the presence of high concn. ofCO_2 and/or ethylene in the atm. or the development of bunch stalk rot. Better control of these factors might produce a further increase in storage life. AA

Grapes

360

Raju (KS). **Marketing of grapes around Hyderabad city.** *Andhra Agricultural Journal* 37(4): 1990: 428

Identification of marketing channels, estimation of input costs and returns to producer, role of pre-harvest contractor, wholesaler, commission agent, retailer, vendor and the consumer was carried for Anab-e-Shahi and Thompson seedless grape var. The price variation between the consumer and the producer was Rs. 4/Kg for Thompson seedless var. The producer's share in the consumer rupee is 0.60 paise for Anab-e-Shahi and 0.65 paise for Thompson seedless. GS

Pears

361

Rizzolo (A), Sodi (C) and Polesello (A). **Influence of ethylene removal on the volatile development in passa crassana pears stored in a controlled atmosphere.** *Food Chemistry* 42(3): 1991: 275-285

The volatile cold room atm. delayed the ripening of pears stored with ethylene removal as indicated by the physico-chemical analysis of the fruit as well. The high-boiling volatile substances (decadienoate esters) gradually increased in fruit pulp of both types of storage (with ethylene removal and non-removal) and reached half the total at the end of 25 wks storage. After post-storage ripening at room temp. the disappearance of pentyl acetate, ethyl propanoate and hexanal and appearance of butyl acetate and hexyl acetate in the fruit flesh were ascertained. After maturation the high-boiling compound differed according to the storage mode. The ratio high-boiling/low-boiling compounds and the acceptance scores of sensory evaluations showed significant correlation. SD

362

Drake (SR), Cavalieri (R) and Kupferman (EM). **Quality attributes of D'Anjou pears after different wax drying temperatures and refrigerated storage.** *Journal of Food Quality* 14(6): 1991: 455-465

Waxed hot (60°C) and cold (0°C) dried pears exhibited lower external but higher internal concn. of CO_2 than non-waxed fruits. After prolonged storage waxed cold dried pears required more time to develop the characteristic ripe yellow colour and retained firmness longer than either waxed hot dried or non-waxed pears. Waxed hot dried pears were slower to develop yellow colour and retained firmness longer than non-waxed pears. Pears waxed after harvest or after 90 days of cold storage demonstrated increased ripening time. SD

Pineapples

363

Van Lelyveld (LJ), Visser (GJ) and Swarts (DH). **The effect of various storage temperatures on peroxidase activity and protein PAGE gel electrophoresis 'Queen' pineapple fruit.** *Journal of Horticultural Science* 66(5): 1991: 629-634

Mature 'Queen' pineapple fruit were stored for 30 days at various temp. and afterwards examined for internal quality. A storage temp. of 8°C is at present generally accepted as the optimum. It was found that peroxidases (PO) activity is correlated with storage temp. and the appearance of storage injury symptoms. High storage temp. of 10, 12 and 16°C resulted in a high PO activity with internal browning of the core and pulp whereas temp. of 2, 4 and 6°C resulted in a low PO activity and white watery pulp. To verify these results, polyacrylamide gel electrophoresis was carried out with the proteins in the fruit. The difference in the 2 extreme temp. of 2°C and 16°C resulted in a high intensity of high mol. mass proteins at 2°C and an increase in intensity of low mol. mass proteins at 16°C. There is a distinct "change over" of these protein band intensities at 8 and 12°C. It is presumed that the correct storage temp. will be within these 2 limits. AA

Strawberries

364

Morris (JR), Main (GL) and Sistrunk (WA). **Relationship of treatment of fresh strawberries to the quality of frozen fruit and preserves.** *Journal of Food Quality* 14(6): 1991: 467-479

Three processing exp. - 0.18% Ca dips, 0.3% low methoxyl pectin, 40°Brix sucrose dips, heat of 70°C, vacuum at 172 mm Hg and drying to 70% moisture with frozen-then-thawed and preserved 'Cardinal' strawberries, showed that firming effect due to Ca and pectin was more with sliced fruits than the whole fruits. Drained wt. loss was reduced by pectin, Ca, sucrose, heat and vacuum in frozen-then-thawed fruits but it was the same or greater among treatments in preserves. The firmness and wholeness of preserves was increased by Ca, vacuum, 40°Brix sucrose, heat and to a lesser extent drying, but individual effects were not additive. The drying treatment reduced colour quality. SD

CONFECTIONERY, STARCH AND SUGAR

Honeys

365

Ghoshdastidar (N) and Charkrabarti (J). **Studies on hydroxy methyl furfural formation during storage of honey.** *Journal of Food Science and Technology (India)* 29(6): 1992: 399-400

The changes in hydroxy methyl furfural (HMF) during honey storage and utility of Fiehe and aniline chloride tests to detect low levels of HMF were studied. Usefulness of parameters like fructose/dextrose ratio, acidity and organoleptic quality as possible indices of honey deterioration has been reported. Formation of HMF appears to be auto-catalytic. AA

Starch

366

Vasanthan (T) and Hoover (R). **A comparative study of the composition of lipids associated with starch granules from various botanical sources.** *Food Chemistry* 43(1): 1992: 19-27

Acid hydrolysis and extraction by selective solvents gave 96.3 - 98.6% lipids from purified wheat, rice, corn, fababean, lentil, potato and cassava starches. The free lipids in chloroform-methanol (CM) extracts (% total starch lipid) ranged from 5% (corn) to 62% (fababean) and free and bound lipids in n-propanol-water (PW) extracts from 44.2% (potato) to 94.8% (corn). In CM extracts neutral lipids (NL) were the major class. In PW extracts, NL were major class in corn and cassava; NL and phospholipids (PL) in potato and PL in wheat, rice and fababean. The free fatty acid composition of lipids was also analysed. SD

367

Steeneken (PAM) and Woortman (AJJ). **Estimation of the length of liquid threads in aqueous starch pastes.** *Food Hydrocolloids* 5(1/2): 1991: 147-149

A method is presented for the measurement of the length of liquid threads in aqueous starch pastes by means of a video technique. The liquid delivery system can be adopted to flow conditions encountered in practice. The thread length increases with starch concn. and was found to be highly dependent on the type of starch. AA

368

Biliaderis (CG). **Structures and phase transitions of starch in food systems.** *Food Technology* 46(6): 1992: 98-100, 102, 104, 106, 108-109, 145

Analysis of mol. structures of starch that can lead to improvements in the quality and shelf-life of starch-containing foods are described in this article. Aspects covered are the phase transitions of granular starch, retrograded starch structures polymorphism and properties of V-amylose. CSA

369

Waniska (RD) and Gomez (MH). **Dispersion behaviour of starch.** *Food Technology* 46(6): 1992: 110, 112, 117-118, 123

Measurement of dispersion of starch in excess water, porridges, parboiled sorghum, foods prepared by extrusion such as snacks and breakfast cereals and the study of the dispersion behaviour of starch in foods can reveal the processing and storage history of the food. CSA

370

Kokini (JL), Lai (L-S) and Chedid (LL). **Effect of starch structure on starch rheological properties.** *Food Technology* 46(6): 1992: 124, 126, 128, 130, 132, 134, 136, 138-139

This article reviews some aspects of starch viscosity-structure relationships in excess and limited water environments and as a function of pressure and extrusion and rheological model for extrusion cooking. 60 references. CSA

371

Godshall (MA) and Solms (J). **Flavour and sweetener interactions with starch.** *Food Technology* 46(6): 1992: 140, 142, 144-145

Experimental and analytical techniques that have been developed to study the interaction of starch with flavour and aroma compounds on mol. basis, equilibrium aspects, analytical methods and its application is discussed. The interaction between starch and sweetener that affect the baking quality and flavour perception of foods is also discussed. CSA

372

Yackel (WC) and Cox (C). **Application of starch-based fat replacers.** *Food Technology* 46(6): 1992: 146-148

Reducing the fat content of foods through the use of fat replacers requires proper ingredient selection and reformulation to match the properties of the full-fat products. Various products that have been successfully reformulated to reduce the fat cotnent are baked goods, dressings, dairy products, meat products, frozen desserts, frostings, sauces and gravies. CSA

373

Kim (CS) and Walker (CE). **Effects of sugars and emulsifiers on starch gelatinization evaluated by differential scanning calorimetry.** *Cereal Chemistry* 69(2): 1992: 212-217

Differential scanning calorimetry (DSC) was used to evaluate the effects of sugar and emulsifier interactions on gelatinization temp. of 3 different starches. A constant wt. ratio of starch to sugar to water (1:1.5:1.5), typical in high-ratio cake batters, was used in the DSC. Sucrose exhibited a greater effect than glucose on raising gelatinization temp. However, with lactose, typical complete gelatinization endotherms could not be observed because of the peak for large lactose crystal melting. Therefore, the solubility of the sugars may have an important effect on starch gelatinization. Low emulsifier concn. (0.6%) did not appear to change DSC starch gelatinization temp. Sugars and emulsifiers may interact and affect the gelatinization temp. ranges. AA

Sugar

374

Kapur (P). **Measurment of degree of supersaturation based on conductivity, viscosity and temperature properties of sugar crystallisation process in the sugar industry.** *Proceedings of the 54th Annual Convection of the Sugar Technologist's Association of India*M37-M43: 1992

A microprocessor based pan monitoring system (MIPMOS) designed by the Central Electronics Engineering Research Institute, Pilani, India, was used in various factories for on-line measurement of sugar crystallisation parameter such as brix, purity, super saturation and massecuite properties including electrical conductivity, a.c. resistivity, viscosity and temp. The computation and display of pan-parameters with the conventional hardwired analog or digital circuitry based systems is difficult and the MIPMOS proved very convenient. GS

375

Sharma (DP). **Falling film evaporator.** *Proceedings of the 54th Annual Convection of the Sugar Technologist's Association of India*M63-M66: 1992

Falling film evaporators are used for best juices and its usefulness for cane juices is attempted. It is used as the 1st body or vapour cell and the precautions to be observed are listed: cost is considered to be the main limitation in its use for cane juices. KAR

376

Lonkar (MY), Bhojaraj (SK) and Gavande (CN). **Falling film evaporator: A potential application to Indian sugar industry.** *Proceedings of the 54th Annual Convection of the Sugar Technologist's Association of India*M77-M85: 1992

Usefulness of adopting falling film evaporator (FFE) in Indian sugar mills is considered based on trial run conducted at M/s Purna SSK Ltd., Busmathinagar, India. FFE reduced the sugar losses due to inversion to min. and the steam saving aspect is also maintained. FFE needs exhaust steam pressure of normal range 0.6 - 0.7 kg/cm^2 g for effective functioning, whereas the rising film evaporator needs 1.2 kg/cm^2 g steam. KAR

377

Peris-Tortajada (M), Puchades (R) and Maquieira (A). **Determination of reducing sugars by the neocuproine method using flow injection analysis.** *Food Chemistry* 43(1): 1992: 65-69

Dialysis was found to be an excellent time saving alternative to decoloration with charcoal when the most suitable Bran Lubbe type C membrane was used and the results correlated significantly with batch method. SD

Massecuite

378

Chandramauli (R). **Continuous pan brief note on design and performance of 'B' massecuite production.** *Proceedings of the 54th Annual Convection of the Sugar Technologist's Association of India*M67-M75: 1992

A continuous pan of 20 t/h capacity for 'B' massecuite is designed. It can boil 20 t of 'B' massecuite/h as required at 94 - 97°Brix and 74 - 77 purity with 0.3 to 0.4 mm crystal size. The steam/vapour factor is 0.4. The design features are described, specifications and technical data of continuous pan are given. The continuous pan performance is compared with the batch, and it is concluded that this will result in significant contribution to saving of cost due to space required, economy of steam and energy. KAR

Sugarcane

379

Chalapathi (K). **A note on post-harvest loss in sugarcane weight on staling.** *Proceedings of the 54th Annual Convection of the Sugar Technologist's Association of India*Ag57-Ag59; 1992

Five cane var. (CO.C 671, CO.6415, CO.7219, CO.62175 and CO.419) were tested for loss in wt. up to 120 h (6 days) after harvest. The loss in wt. at 120 h after harvest was 7.14% for CO.C671, 13.04% for CO.6415, 7.5% for CO.7219, 9.09% for CO.62175 and 24.21% for CO.419. After harvest, loss in wt. was fast in CO.419 and CO.6415. KAR

380

Das (YG). **Gearless driver for driving cane sugar mills.** *Proceedings of the 54th Annual Convection of the Sugar Technologist's Association of India*E1-E4; 1992

An evaluation of gearless drive hydraulic motors in different sugar mills in India is reported. These are used for getting optimum speeds of mills and max. extraction and for max. crushing without affecting extraction. Working details of the system in a sugar mill are given. KAR

381

Singh (M). **New concept in evaporator system design.** *Proceedings of the 54th Annual Convection of the Sugar Technologist's Association of India*E5-E11; 1992

A new system of evaporation to meet the requirements of desired evaporation and steam/fuel balance is proposed. The process conditions relevant to heating evaporation and boiling are listed. This system. will result in capital saving of one million rupees and lower the maintenance, replacement and operating costs. KAR

382

Lal (C). **Automatic sugar filling and weighing system.** *Proceedings of the 54th Annual Convection of the Sugar Technologist's Association of India*E13-E16; 1992

An auto sugar bagging system, to replace the present weightment done on over weighbridges is described. The system accuracy is plus or minus 100 g for 100 kg weighment. The system saves manpower in packing and reduces handling cost. KAR

383

Srinivasan (S) and Gurugovind (J). **Simple means to save steam.** *Proceedings of the 54th Annual Convection of the Sugar Technologist's Association of India*M19-M27; 1992

Steam economy in sugar factories could be done by avoiding pan boiling technique. A falling film evaporator was devised to streamline the rate of steam/vapour consumption and to avoid changes in steam requirement. About 4 to 5% steam on cane is saved by this method. Even at lower crushing rate, the steam % cane could be maintained between 48 and 50% on cane. GS

384

Ramalingam (M) and Vijayendran (V). **A comparative study of condensing and cooling system.** *Proceedings of the 54th Annual Convection of the Sugar Technologist's Association of India*M29-M36; 1992

Multijet co-current, barometric co-current and barometric counter current types of condensers were compared for their efficiency and power consumption. Barometric counter current condenser with water air ejector coupled with cooling tower was the best with respect to efficiency and power consumption. Water air ejector is preferred as water does not get heated up, and is mixed directly in injection cold water channel. GS

Sugarcane juices

385

Chavan (SM) and Jadhav (SJ). **Direct method for assay of starch in sugarcane juice and its products.** *Proceedings of the 54th Annual Convection of the Sugar Technologist's Association of India*G1-G16; 1992

A simple direct colorimetric method for starch detn. in sugarcane juice, plantation white sugar, molasses, syrup and massecuite is described. In this method the optical densities of blue starch iodine complex is measured with some modifications; it eliminates sucrose addition and avoids precipitation of starch with alcohol. Starch recovery by this method was 99.2% in plantation white sugar, 97.5% in sugarcane juice and 97.4% in molasses. GS

386

Raj Kumar, Singh (V), Rastogi (S), Brar (P), Mehta (RN), Raina (P). **Initial trials with electrodialysis system for demineralisation of clear juice.** *Proceedings of the 54th Annual Convection of the Sugar Technologist's Association of India*M1-M18; 1992

A membrane process electrodialysis system involving separation of cations and anions by an ion exchange membrane is described. Demineralisation of sugarcane juice with this system showed following advantages: (i) quality of sugar cane juice improved due to removal of salts. Ash content reduced by 23 - 37%; K by 38 - 50%; Na by 10 - 35% and Ca by 15 - 30%; colour removal was 11 - 19%; purity rose by 1 - 2% and Brix drop was 3 - 6%; (ii) molasses formation reduced and saved sugar loss by 0.15% cane, (iii) cooling was not required for colour removal, (iv) scaling of heat exchangers was not required, and (v) retarded sugar crystallization problem was solved. GS

BAKERY PRODUCTS

387

Ramadevi (M) and Vijaya Khader. **Use of ghee residue in baked products and chikki.** *Andhra Agricultural Journal* 37(4); 1990; 374-379

Utilization of ghee residues available in dairies was explored. Ginger biscuits, masala biscuits, cookies and chikki were prepared by incorporating ghee residue; the proximate composition and protein quality of the formulated products and the keeping quality of the products were determined after packing in 0.03 and 0.06 mm polyethylene bags and storing for 15 and 30 days. Ghee residue increased the protein content, but not the protein quality. All the products were acceptable at 25% level of ghee residue incorporation. *In vitro* digestibility of protein was 50%. The available lysine content in the baked product also decreased. Neither the thickness of polyethylene bag (0.03 and 0.06 mm) nor the storage period (30 days) in atmospheric temp. had any effect on the *in vitro* digestibility or on the content of available lysine. GS

388

Handoo (SK), Gupta (S) and Agarwal (TN). **Bakery shortening.** *Indian Baker* 22(4); 1991; 15-17

This article reviews the types, functions in baking process, quality, plasticity, consistency, creaming power and nutritional aspects of shortening. SD

389

Saxena (AK) and Bakhshi (AK). **Effect of mixing times, different sponges and of different ingredients on baking characteristics of flours.** *Indian Baker* 22(4); 1991; 29-36

Commercial wheat flours (roller mill) evaluated for mixing times, different additives and sponges for fermentation showed that 2 mixing time was favourable, addition of glycerol monostearate, fat, sugar and 40% sponge produced satisfactory loaves with better vol. and specific vol. with uniform crumb comparable to the quality of breads made from lab. milled flours. SD

390

Kometani (T), Kitatsuji (E) and Matsuno (R). **Baker's yeast mediated bioreduction: Practical procedure using EtOH as energy source.** *Journal of Fermentation Technology (Hakko Kogaku Zasshi)* 71(3); 1991; 197-199

Baker's yeast mediated bioreduction of prochiral ketones was investigated with respect to its energy source. The rate of glucose consumption was 5 times that of the reduction of ethyl acetoacetate (EA), and the reduction of EA proceeded under aerobic condition after glucose had been consumed. From these results, reduction by baker's yeast based on the regeneration system for NAD (P) H through the oxidative pathway of ethyl alcohol (EtOH) was developed. Under anaerobic conditions, reduction by the new procedure did not occur. The optimum conditions of EtOH concn. and temp. were about 200 mM and 30°C, respectively. At higher than 400 mM EtOH concn., the reduction soon leveled off. The rate of EtOH consumption was less than twice that of EA reduction, and no by-products except for CO_2 were detected, so the new procedure is a practical one. AA

391

Swyngedau (S) and Peleg (M). **Characterization and prediction of the compressive stress-strain relationship of layered arrays of spongy baked goods.** *Cereal Chemistry* 69(2); 1992; 217-221

The sigmoid compressive stress-strain curves of crumbs from 3 types of bread, pound cake, and double-layered arrays of these materials (0 - 70% deformation) are described by 2 kinds of 3-parameter mathematical models. The model structures were especially selected so that they could be transformed algebrically from stress-strain to strain-stress relationships or be determined directly from the strain-stress data by nonlinear regression. The model parameters enabled calculation of a specimen's deformation-force relationship with any given dimensions. When an in-series array of objects having the same cross-sectional area is deformed uniaxially, the force along the array is the same and the deformation the sum of that of its components. Since sponge compression is not accompained by a significant lateral expansion, the effects of friction between the layers can be neglected. This enabled the prediction of the force-deformation and stress-strain relationships of double-layered arrays with reasonable accuracy from the compression parameters of the components' material. AA

392

Kulkarni (SD). **Use of soybean in bakery products.** *Invention Intelligence* 26(8): 1991: 376-377

Bread prepared with 12% soy-fortified wheat flour contains 50% more protein and will be 3 times as rich in proteins as non-fortified bread due to balanced amino acid pattern. A var. of soy-fortified breads can be produced: 6% and 12% soy-fortified breads: pan bread with 6% soy flour by 70% sponge method; 100% sponge method and straight dough method; and French bread with 6% soy flour by 60% sponge method, 100% sponge method and straight dough method. Other products tried are yeast leavened doughnuts and cookies (with 6% soy flour). These methods can be considered for adoption. BV

Bread

393

Sekhon (KS), Sharma (S) and Nagi (HPS). **Technology of flat bread production.** *Indian Baker* 22(4): 1991: 18-19

The recipe developed and baking schedule standardized are given. Flat bread made resembling *chapathi* in appearance was highly acceptable and showed PER similar to that of bread. Antistaling and antimold agents can be incorporated. Sodium stearoyl-2-lactylate and glycerolmonostearate at 0.5% level each reduced the hardness during storage. Addition of calcium propionate at 0.5% level prevented mold and extended shelf-life to 8 days at 37°C and 12 days at 4°C. SD

394

Indrani (D) and Venkateswara Rao (G). **Effect of improvers on the quality of whole wheat flour bread.** *Journal of Food Science and Technology (India)* 29(6): 1992: 357-359

Effect of improvers on the quality of whole wheat flour bread showed an increase in the specific loaf vol. to varied levels. Sodium stearoyl-2-lactylate showed highest response in improving the specific loaf vol. followed by polyoxyethylene sorbitan monostearate, glycerol-monostearate, polyoxyethylene sorbitan monopalmitate, diacetyl tartaric acid esters of monoglycerides and soya lecithin. The crumb characteristics of whole wheat flour bread are also improved, while the crust shape, crumb colour and typical wheaty taste of whole wheat flour bread were unaffected. AA

395

Indrani (D) and Venkateswara Rao (G). **Effect of ingredients on the quality of whole wheat flour bread.** *Journal of Food Science and Technology (India)* 29(6): 1992: 360-363

The improvement in the quality of whole wheat flour bread with 8% fat, 0.5% sodium stearoyl-2-lactylate (SSL) and 20 p.p.m. potassium bromate was better by sponge and dough method compared to that by straight dough and mechanical dough development methods. The specific loaf vol. decreased with the increase in sugar content beyond 5.0% in straight dough and sponge and dough methods but remained unaffected in mechanical dough development method. Max. increase in specific loaf vol. was caused by 200 p.p.m. ascorbic acid in mechanical dough development method and by 0.5% SSL in straight dough and sponge and dough methods. With optimum levels of all ingredients, max. improvement in the quality of whole wheat flour bread was obtained by sponge and dough method. AA

Cakes

396

Sinha (LK). **Baking of batter type cakes: Quality factors, fault and remedy.** *Indian Baker* 22(4): 1991: 21-27

Batter type cake is more popular among the 3 types. The functional properties of ingredients, formula standardization, leavening and mixing methods, baking and cooling loss, baking temp. and different types of defects, causes and remedial measures are presented in detail. SD

397

Kim (CS) and Walker (CE). **Interactions between starches, sugars and emulsifiers in high-ratio cake model systems.** *Cereal Chemistry* 69(2): 1992: 206-212

The cake flour in a high-ratio cake model system was replaced by a blend of commercial wheat starch, vital gluten, and a lipid mixture of lecithin and ethoxylated mono-diglycerides. Then the wheat starch in the control formula was replaced with corn or potato starch. Lactose or dextrose (glucose) replaced 50% of the sucrose, and additional emulsifier, sucrose ester F-160, or polysorbate 60 also was used. Potato starch produced acceptable cakes, whereas corn starch did not. A 50% dextrose replacement for sucrose improved the cake vol. and grain structure with corn starch. The potato starch, lactose and polysorbate 60 combination produced a significant increase in batter viscosity, but this was not true for corn starch batters containing lactose. The increased batter viscosity tended to aid in air incorporation. Both additional emulsifiers improved all cake vol. The addition of polysorbate 60 to the wheat starch batter containing lactose produced the highest cake vol. with the best grain structure. Dextrose tended to retain more cake crumb moisture. Partial flour replacement by commercial starches might be beneficial in high-ratio cake baking, if proper combinations of starch, sugar, water and emulsifier are used. AA

Cookies

398

Gaines (CG), Kassuba (A) and Finney (PL). **Instrumental measurement of cookie hardness. I. Assessment of methods.** *Cereal Chemistry* 69(2): 1992: 115-119

Probing and a 3-point break technique for instrumental measurement of cookie hardness were appraised. Both techniques were used to evaluate the hardness of cookies produced by 3 lab. formulations: the AACC micromethod and macromethod for sugar-snap cookies and a new commercial formula for wire-cut cookies. The 3 formulas differ in their ratios of sugar, shortening, and water. Both instrumental and sensory measurements indicated that wire-cut formula cookies were the least hard of the 3 formulations. The 3-point break technique measured both hardness and brittleness, but the probe technique required less product. Probing was used to assess differences among 4 wheat cvs and effects of postbake age on cookie hardness. Least significant differences and variances for probing data (as a percentage of the range of hardness observed with the 4 cvs) were usually smallest for the wire-cut formula cookies. AA

399

Gaines (CS), Kassuba (A), Finney (PL) and Donelson (JR). **Instrumental measurement of cookie hardness. II. Application to product quality variables.** *Cereal Chemistry* 69(2): 1992: 120-125

A probing technique was used to measure the effects of various treatment on the hardness of cookies produced by two lab. formulations, the AACC micromethod for sugar-snap cookies and a new formula for wire-cut cookies typical of commercial products. The technique was able to quantify hardness differences associated with wheat cv, wheat class blending, quality of ingredients, cookie geometry, wheat test wt., kernel shriveling, crop year, and flour protein content. Higher protein content and more kernel shriveling were associated with harder cookies. Higher flour protein content resulted in harder wire-cut formula cookies (as is usually observed in commercial baking); however, sugar-snap cookies were thicker and less hard. Probing was also used to evaluate the hardness of cookies produced from two pairs of flours that were fractionated and then reconstituted with one to three fractions interchanged. Fractions that contributed positively to cookie hardness were tailings, gluten and water-solubles. Fractions appeared to contribute to hardness in the order of their hydrophobicity. AA

400

Nishibori (S) and Kawakishi (S). **Effect of various sugars on the quality of baked cookies.** *Cereal Chemistry* 69(2): 1992: 160-163

The quality of cookies baked with pentoses, hexoses and di- and trisaccharides, cookie doughs prepared from wheat flour, eggs, butter, sugar and sodium bicoarbonate were heated at 150°C for 10 min in an electric oven was studied. The baked cookies were extracted with methanol-water (3:1, v/v), and the extracts were analyzed by HPLC. A main peak from the cookie extracts containing pentoses was isolated and identified as furfural. The peaks from the cookies containing sugars other than pentoses were 2,3-dihydro-3,4-dihydroxy-5-acetylfuran (DDAF), 2,3-dihydro-3,5-dihydroxy-6-methyl-4(H)-pyran-4 -one (DDMP), and 5-hydroxymethylfurfural (HMF). DDAF and DDMP appeared in batches that included hexoses. DDAF and DDMP produce sweetness and cookie like flavour; hexoses as sweeteners are thus useful in the formation of good cookie flavor. Results indicated on the physical properties of cookies - vol. expansion, form colour, and surface condition - suggest that difference in cookies made with various sugars result from differences in melting point temp. and solubility. The results also indicate that of all the baked cookies studied, those with fructose exhibit the most favourable physical properties and flavour. AA

Doughs

401

Mani (K), Eliasson (A-C), Lindahl (L) and Tragardh (C). **Rheological properties and breadmaking quality of wheat flour doughs made with different dough mixers.** *Cereal Chemistry* 69(2): 1992: 222-225

Four dough mixers - farinograph, mixograph, Krups, and Hobart - were used to make wheat flour doughs. Two sizes of farinograph mixers, with flour capacities of 10 g and 300 g, were tested. Dynamic rheological properties of the doughs were measured with a cone-and -plate system. The storage modulus (G') decreased with mixing time at different rates depending on the severity of mixing. Mixing was most severe with the mixograph and Krups mixers. As the dough rested, it became more elastic, and the phase angle decreased. Rheological properties were related to the empirical measurements (farinogram and mixogram) and to the results of test baking. A good correlation was observed between the farinogram and storage modulus values. With the mixograph, however, the empirical optimum was reached 1 min later than the optimum determined from the fundamental rheological measurements and baking tests. The storage modulus and phase angle values associated with the optimum quality of the finished product were fairly constant and did not depend on the mixing equipment. For the specific blend of flour used (approx. 70% winter wheat of the var. Kosack and Folke and 30% spring wheat of the var. Kadett), the best quality bread (as indicated by loaf vol. and porosity) was obtained when the av. storage modulus was approx. 12 kPa. AA

MILK AND DAIRY PRODUCTS

402

Jackson (LS) and Lee (K). **The effect of dairy products on iron availability.** *CRC Critical Reviews in Food Science and Nutrition* 31(4): 1992: 259-270

This review is a critical evaluation of the literature dealing with the interactions between dairy products and Fe availability. Aspects covered include: Fe availability in milk (cow's milk, human milk) and effect of milk components on Fe availability (protein, casein, whey protein, lactoferrin and other minor proteins and mechanism of inhibition), Ca and phosphate. 86 references. BV

403

De Jong (P), Bouman (S) and van der Linden (HJLJ). **Fouling of heat treatment equipment in relation to the denaturation of β-lactoglobulin.** *Journal of the Society of Dairy Technology* 45(1): 1992: 3-8

The relationship between the denaturation of β-lactoglobulin (β-lg) and the deposition of milk constituents in a heat exchanger was investigated. Experiments were carried out on a plate heat exchanger with skim milk by applying different temp.-time combinations in the temp. range 70 to 122°C. The aggregation of β-lg was measured by HPLC, and the amount of deposits on the plates of the heat exchanger was determined by chemical oxygen demand measurements. Based on the results of the experiments, a fouling model at temp. up to 100°C is proposed and some measures to reduce the amount of deposits by more than 50% are given. AA

Milk

404

Grufferty (MB) and Mulvihill (DM). **Emulsifying and foaming properties of protein isolates prepared from heated milks.** *Journal of the Society of Dairy Technology* 44(1): 1991: 13-19

Surface activities at the air-water interface and the emulsifying and foaming properties of sodium caseinate, conventional casein-whey protein co-precipitate prepared from milk heated at 90°C x 15 min at pH 6.6 and milk protein isolates prepared from milks heated at 90°C x 15 min at pH 7.5 or at 60°C x 3 min at pH 10.0 were determined. The surface activities of the 4 proteins at the air-water interface were similar, while the emulsifying capacity and emulsion stabilizing ability of casein was less than that of the milk protein isolates or the conventional co-precipitate. Fat surface areas formed on emulsification with the 4 proteins were similar and increased with increasing power input. Total protein adsorbed at the interface and protein load (mg protein/m^2 fat) for the emulsions stabilized by sodium caseinate and the milk protein isolate prepared from the milk heated at 90°C x 15 min at pH 7.5 were similar and lower than those for emulsions stabilized by the other 2 proteins. Foam overruns followed the order: sodium caseinate > milk protein isolate prepared from milk heated at 90°C x 15 min, pH 7.5 > milk protein isolate prepared from milk heated at 60°C x 3 min, pH 10.0 > conventional co-precipitate, while foam stabilities followed the reverse order. AA

405

Muir (DD), Hunter (EA) and West (IG). **Optimization of the properties of dried skim milk for use in white sauce suitable for use with frozen products.** *Journal of the Society of Dairy Technology* 44(1): 1991: 20-23

The relation between the composition of dried skim milk and the texture and viscosity of white sauce in which the powder was a major ingredient has been investigated. The level of whey protein denaturation was inversely related to sauce viscosity. Modest increases in protein content of the powder, achieved by ultrafiltration, led to improvements in viscosity of white sauce. The effects were retained against a wide range of experimental protocols and both freshly prepared sauces and sauces which had been frozen then recooked.. AA

406

Griffiths (MW), Banks (JM), McIntyre (I) and Limons (A). **Some insight into the mechanism of inhibition of psychrotrophic bacterial growth in raw milk by lactic acid bacteria.** *Journal of the Society of Dairy Technology* 44(1): 1991: 24-29

Addition of lactic acid bacteria to refrigerated raw milk inhibited growth of Gram-negative psychrotrophic bacteria. In order to obtain complete inhibition, population levels of lactic acid bacteria approaching 1×10^8 cfu/ml were required. At this inoculum level a substantial pH change was observed in the milk during storage. The degree of inhibition was related to the final pH of the milk. Inhibition of the psychrotrophs was brought about by adjustment of pH with L(+) lactic acid but not by HCl. Inhibition by the lactic acid bacteria was observed in heat-treated milks seeded with a small vol. of raw milk, but no inhibition of Gram-negative psychrotrophic growth was observed when cell-free preparations of lactic acid bacteria were used. A cell-free ultrafiltrate of one lactic acid culture did inhibit a strain of *Bacillus circulans*. AA

407

Pal (MA), Yadav (PL) and Sanyal (MK). **Physico-chemical and sensory characteristics of low-fat *paneer* from high heated milk.** *Indian Journal of Dairy Science* 44(7): 1991: 437-441

The av. values of physico-chemical properteis of low-fat *paneer* made by heating a mixture of cow and buffalo milk (1:1) separately at 118 and 90°C showed significant increase ($P < 0.05$) in yield but decrease ($P < 0.05$) in fat content at 118°C than at 90°C. The values for protein, lactose, fat (on DM basis), ash, titratable acidity, pH and moisture absorption capacity between the 2 types were nonsignificant. Low-fat *paneer* made from milk, heated at 118°C scored higher ($P < 0.05$) for body and texture, odour, taste and for overall acceptability than *paneer* made from milk heated at 90°C. Loss of fat in whey at 118°C was also significantly less ($P < 0.05$) than at 90°C. Results indicate that heating milk at 118°C without holding resulted in higher yield of low-fat *paneer* with better sensory characteristics and also lower loss of solids in whey. SRA

408

Adhikari (AK) and Singhal (OP). **Changes in the flavour profile of indirectly heated UHT milk during storage: Effect of Maillard browning and some factors affecting it.** *Indian Journal of Dairy Science* 44(7): 1991: 442-448

Indirectly heated UHT milk (at 140°C/3 sec. and packed in polylaminated tetrapak) was stored at 22 and 37°C to study the effect of some factors on Maillard browning which lead to stale flavour and bitter taste during storage. Both free and total Hydroxy-methylfurfural (HMF) content reduced sharply within 14 days of storage at both the storage temp. Thereafter, they increased significantly till spoilage. Free HMF content increased from 2.91 to 7.85 and 7.04 μmoles/L and total HMF content increased from 7.87 to 26.77 and 21.87 μmoles/l at 37 and 22°C respectively after 33 days of storage. Sharp reduction (about 50% within 17 days) in free sulphydryl compounds (-SH groups) due to highgih dissolved oxygen content (7.89 p.p.m.) improved the flavour score initially but subsequently resulted in development of pronounced stale flavour and bitter taste earlier at 37°C (within 22-24 days) than at 22°C (after 25-26 days), making the product unacceptable after 26 - 28 days. The pH values dropped from 6.82 to 6.45 and 6.52 at 37 and 22°C respectively after 33 days. Free -SH compounds had a definite inhibitory effect on Maillard browning at the early stages of storage but dissolved oxygen enhanced it by reducing -SH compounds in later stages. AA

409

Shilton (NC),. Johnson (A) and Lewis (MJ). **An investigation of a possible relationship between the ethanol stability of milk and the fouling of milk in an ultra high temperature process.** *Journal of the Society of Dairy Technology* 45(1): 1992: 9-10

Goat milk

410

Shiv Ram and Sindhu (JS). **Salt balance and heat stability of goat milk as affected by pH.** *Indian Journal of Animal Science* 61(7): 1991: 753-756

About one-fourth of the Ca, half of the P, 65 to 70% Mg and 80% citrate (cit) were in the dissolved phase of milk. Ratios of Ca/P, (Ca + Mg)/P and (Ca + Mg)/(P + cit) were < unity indicating a preponderance of polyvalent anions over such cations, more so in the dissolved form. The ratio of all cations to all anions was higher than one establishing a higher concn. of monovalent-cations in goat milk. Average HCT at 130°C was 17 min for individual goats. High concn. of Na significantly increased the HCT but a high concn. of cit in skim milk or in the dissolved phase significantly decreased it. The effect of dissolved Ca was similar to that of citrate. In composite milk samples a significant and positive correlation between HCT and pH, and a negative correlation between HCT and citrate were observed. AA

Milk products

411

Prajapathi (PS), Gupta (SK), Patil (GR) and Patel (AA). **Cost estimation of butter flavoured low-fat spread.** *Indian Journal of Dairy Science* 44(6): 1991: 384-388

The cost of production of butter flavoured low-fat spread (40% fat) for a 4 tonnes/day plant was Rs. 34.80/kg. The cost of raw material accounted for 63.1% of the total costs, whereas processing and packaging, and general expenses (marketing and distribution) accounted for 23.4 and 13.5% of the total cost respectively. BV

Cheese

412

Rodriguez (E), Martin (R), Garcia (T), Azcona (JI), Sanz (B), Hernandez (PE). **Indirect ELISA for detection of goats' milk in ewes' milk and cheese.** *International Journal of Food Science and Technology* 26(5): 1991: 457-465

An indirect ELISA (enzyme-linked immunosorbent assay) has been developed successfully for the detection of defined amounts of goats' milk (1 - 25%) in ewes' milk and cheese. The assay uses polyclonal antibodies raised in rabbits against goats' caseins (GC). The anti-GC antibodies were recovered from the crude antiserum by immunoadsorption and elution from a column containing immobilized goats' caseins. The anti-GC antibodies were biotinylated and rendered goats' milk specific by mixing them with lyophilized bovine and ovine caseins. The assay was developed in a non-competitive ELISA format and it comprised coating plates with extracts from samples. ExtrAvidin-peroxidase was used to detect the biotinylated anti-GC antibodies bound to goats' caseins immobilized on 96-well plates. The colour developed by the subsequent enzymic conversion of the substrate resulted in discernible differences in optical densities when assaying mixtures of ewes' milk and cheesecontaining variable amounts of goats' milk. AA

413

Bertola (NC), Bevilacqua (AE) and Zaritzky (NE). **Changes in rheological and viscoelastic properties and protein breakdown during the ripening of 'Port Salut Argentino' cheese.** *International Journal of Food Science and Technology* 26(5): 1991: 467-478

Changes in the rheological behaviour and viscoelastic properties during ripening at 10°C of a soft cheese (Port Salut Argentino) packaged in a plastic film (EVA-EVA) were analysed. Casein degradation was measured by electrophoresis slab gels: α_{s1} casein degradation was rapid and striking compared with that of β-casein. Rheological parameters obtained from uniaxial compression tests changed during ripening: hardness decreased, adhesiveness and cohesiveness increased. An exponential decay equation with 2 Maxwellian elements and one elastic in parallel was fitted to characterize stress relaxation curves. Viscoelastic parameters (elastic moduli and relaxation times) were obtained using non-linear regression analysis. The elastic equilibrium modulus decreased 80% during the ripening period and the viscosity of the element with the highest relaxation time decreased 20%. The parametres represented the changes observed in cheese hardness and elasticity during ageing time and were related to the extent of casein breakdown. AA

Cheddar cheese

414

Patel (HG), Upadhyay (KG) and Pandya (AJ). **Effect of milk acidity at setting and whey acidity at draining on the residual rennet activity in buffalo milk Cheddar cheese.** *Indian Journal of Dairy Science* 44(7): 1991: 427-430

Results showed no significant change in pH, titratable acidity or coagulant retention in milk acidities set at different levels. An increase in whey acidity at draining upto 0.18%, significantly increased the acidity of resultant cheese. The values of residual coagulant activity were higher compared to cow milk Cheddar cheese. SRA

Chhana spread

415

Tewari (BD) and Sachdeva (S). **Effect of processing variables on quality of spread prepared from *Chhana*.** *Indian Journal of Dairy Science* 44(6): 1991: 375-379

A good flavoured and spreadable *chhana* spread could be made from cow and buffalo milk *chhana* containing 62.5 and 63.5% moisture respectively. The pH of the most acceptable spread was 5.0. Addition of emulsifier and heat treatment did not improve the body and texture of the spread. Addition of 30% *chakka* (fermented milk product) or 20% ripened Cheddar cheese further improved the sensory quality of the spread. SRA

416

Joshi (SV), Majgoakar (SV) and Toro (VA). **Effect of different coagulants on yield and sensory quality of *Channa* prepared from milk of cow, buffalo and goat.** *Indian Journal of Dairy Science* 44(6): 1991: 380-383

Buffalo milk produced significantly higher yield of *Chhana* as compared to cow and goat milk. *Chhana* prepared from buffalo milk had hard body and coarse texture. Cow and goat milk produced *chhana* with soft body and smooth texture. *Chhana* from cow and buffalo milks had acceptable flavour whereas that from goat milk had slightly acidic flavour. The yield of *chhana* did not vary significantly due to different coagulants. Lactic, tartaric and citric acids produced *chhana* with soft body, whereas lemon juice resulted in *chhana* with slightly hard body. On the basis of total sensory scores, lactic was the best. AA

Dahi

417

Turamabekar (SV) and Kulkarni (MB). **Studies on the particle size distribution of mixed milk *dahi*.** *Indian Journal of Dairy Science* 44(7): 1991: 449-452

The incubation period (12, 17, 22 and 27 h) had significant effect on the particle size-distribution of mixed milk *dahi* (MMD). The different layers of MMD (top, middle, bottom) showed different particle size distribution pattern. The mean particle size of MMD ranged from 272.5 μm to 5.95 mm, with the small sized particles (1 mm to 45 μm) dominating the curd mass irrespective of the incubation period, pH or layer height of MMD. SRA

418

Jogand (SB), Lembhe (AP), Ambedkar (RK) and Chopade (SS). **Incorporation of additives to improve the quality of *dahi*.** *Indian Journal of Dairy Science* 44(7): 1991: 459-460

Addition of 0.1% sodium alginate or gelation or 1% starch as additives can overcome the whey off problem and improve the quality of *dahi*. SRA

Ghee

419

Wadhwa (BK) and Jain (MK). **Production of ghee from butter oil - a review.** *Indian Journal of Dairy Science* 44(6): 1991: 372-374

This review presents the various approaches (skim milk dahi/dahi powder, flavour concentrates and synthetic flavour compounds) for simultaneous simulation of ghee flavour in butter oil (BO). The various flavour simulation studies suggest possible innovations in making ghee via BO and to improve its shelf-life. The conversion of BO into flavoured BO introduces a diversification in Indian dairy industry. 8 references. BV

Gulab jamun

420

Prajapati (PS), Thakar (PN), Miyani (RV) and Upadhyay (KG). **Influence of use of khoa prepared from concentrated milk on quality of gulab jamun.** *Indian Journal of Dairy Science* 44(6): 1991: 395-397

Gulab jamuns prepared from different *Khoa* were evaluated for chemical composition, rheological properties and sensory quality. The total solids (TS) of 3 different types of *gulab jamun* ranged between 70.96 to 72.98% and were statistically at par with each other. The product made with khoa from conc. milk had higher fat content, lower protein content and were higher sugar absorbants. The products made with 40% TS conc. milk were soft and products made with 50% TS conc. milk were hard. The flavour score of product made from 40% TS khoa was slightly lower (30.0) whereas use of 50% TS *khoa* for *gulab jamun* preparation gave slightly higher flavour score (31.9). An improved body and texture score was obtained in *gulab jamun* prepared from *khoa* having 40 and 50% TS conc. milk as compared to control. The results of the present study also indicates the manufacturing cost reduction due to reduction in steam consumption and saving in labour and time for *khoa* preparation by the use of vacuum conc. milk. SRA

Ice creams

421

Cheema (AS) and Arora (KL). **Cost estimation for filled ice-cream.** *Indian Journal of Animal Science* 61(7): 1991: 742-746

The cost of manufacture of filled ice-cream was compared with that of control ice-cream. The milk fat and 3 types of vegetable oils, viz. groundnut, soybean and corn, were used for the manufacture of control and filled ice-creams. The cost per 100 ml was Rs. 1.12, Rs. 1.07 and Rs. 1.12 respectively, against Rs. 1.29 for control ice-cream. These were cheaper by 13 - 17%. AA

Khoa

422

Ranganadham (M) and Rajorhia (GS). **Tray drying of *khoa*.** *Indian Journal of Dairy Science* 44(6): 1991: 398-400

The rate of drying in the tray process is affected by temp. of drying, moisture content (MC) in the product, air pressure in the drying chamber, particle size and bed thickness of the product in the trays. Samples of *khoa* were dried at 50, 60, 70°C and MC of 30, 20 and 15%. Preliminary trails showed that temp. above 70°C caused intensive browning and grittiness in the final product. The rate of drying during first 30 min was constant at all temp. Vacuum drying of *khoa* resulted in a faster rate of evaporation. The time required for dehydrating from 20% moisture to 4% was 82 min under vacuum and 98 min in ordinary hot air dryer. Size of *khoa* particles caused significant changes in drying curves. Larger size particles took longer time to dry than smaller particles. The amount of material loaded in a given area also affected the rate of drying. SRA

Yoghurts

423

Vedamuthu (ER). **The yoghurt story - past present and future.** *Dairy, Food and Environmental Sanitation* 11(9): 1991: 513-514

Covers yoghurt quality (shelf-life) and sources of fungal contamination of yoghurt. BV

424

Vedamuthu (ER). **The yoghurt story - past, present and future. Part VII.** *Dairy, Food and Environmental Sanitation* 11(10): 1991: 583-585

Covers varieties of yoghurt, manufacture of yoghurt drinks and research and development needs. BV

425

Ulberth (F). **Headspace gas chromatographic estimation of some yoghurt volatiles.** *Journal of the Association of Official Analytical Chemists* 74(4): 1991: 630-634

A headspace GC method is described for the detn. of acetaldehyde, ethanol, acetone, diacetyl, and 2-butanone in yoghurt. Yoghurt (2 g) is equilibrated 1 h in a 10 ml vial at 60°C, and 0.25 ml headspace gas is split-injected. The volatiles are baseline-separated in < 5 min by using a thick film capillary column coated with SE-54. An external standard calibration method fulfills the requirements for an accurate detn. of the yoghurt aroma components. The accuracy of this method was checked by the standard addition method. The precision of the method, in terms of the relative standard deviation, depends on the analyte concn. At the 10 p.p.m. volatile level, RSD is 2%, and at the 0.1 p.p.m. level, 15%. AA

Milk proteins

426

Dickinson (E), Hunt (JA) and Dalgliesh (DG). **Competitive adsorption of phosvitin with milk proteins in oil-in-water emulsion.** *Food Hydrocolloids* 4(5): 1991: 403-414

Competitive adsorption at pH 7 has been investigated at the emulsion droplet surface and the planar oil-water interface for binary mixtures of the egg-yolk protein, phosvitin, and a milk protein, β-casein or β-lactoglobulin. Analysis of the aqueous phase of *n*-tetradecane-in-water emulsions made with a mixture of phosvitin + milk protein (0.5 wt.% total protein) indicates that the milk protein predominates at the surface. This is thermodynamically consistent with the much lower surface activity of phosvitin at the *n*-tetradecane-water interface. In exp. involving addition of milk protein after emulsification, β-casein displaces 70% of adsorbed phosvitin within a few min, and then another 10% over a period of 48 h, whereas β-lactoglobulin displaces 57% within a few min, but none thereafter. Taken together with previous results for the competitive adsorption of different milk proteins, the data are used to discuss how the time-dependent displacement behaviour of a disordered protein β-casein differs from that of a structured globular protein β-lactoglobulin. Special features of the adsorption behaviour of phosvitin are related to its high level of phosphorylation and its high charge density. AA

Caseins

427

Surve (SS) and Mahoney (RR). **Thermal stabilization of four microbial β-galactosidases by histidine, casein amino acids and casein.** *Journal of Food Biochemistry*201-207: 1991

Casein amino acids were not effective in the thermal stabilization of 4 microbial (*Escherichia coli, Kluyveromyces marxianus, Streptococcus thermophilus* and *Aspergillus oryzae*) β-galactosidases as compared to casein. For the *K. marxianus* enzyme, histidine alone was as effective as casein and the stabilizing effect was proportional to the logarithm of the histindine concn. BV

MEAT AND POULTRY

Meat

428

Mohamed Ali (LH) and Heath (JL). **Effect of muscle fibre orientation on *Pectoralis superficialis* muscle expansion in NaCl solutions.** *Journal of Food Processing Preservation* 15(5): 1991: 303-314

Volume of broiler chicken muscle significantly increased with increased concn. of NaCl. Also expansion was significantly different, less along the longitudinal axes of the muscle fibre, more along the perpendicular to the longitudinal axes and so on indicating that muscle fibre orientation needs to be considered where tissue expansion and absorption characteristics are involved. SD

429

Okonkwo (TM), Obanu (ZA) and Ledward (DA). **Characteristics of some intermediate moisture smoked meats.** *Meat Science* 31(2): 1992: 135-145

Intermediate moisture smoked beef was prepared by cook-soak/equilibration in a sol. containing NaCl, sodium nitrite and potassium sorbate. Two further sol. contained glycerol and glycerol + 'onion' in addition to the above ingredients. half the samples in each treatment group were smoked for 18 h (heavy smoking) and the others for 4 h (light smoking) at 50°C. All samples developed the pink-red colour of nitrite cured meat but those treated with glycerol were darker, presumably due to decreased moisture contents. Glycerol increased the apparent moisture, fat and sodium dodecyl sulphate (SDS) soluble protein contents and also improved the conversion of haemoproteins to the cooked cured form but decreased the percent soluble hydroxyproline. Smoking caused a marked decrease in moisture, SDS-soluble protein and soluble hydroxyproline contents and slightly decreased the available lysine and percent conversion of the haemoproteins to the cured nitrose forms. Smoking also caused increased darkening and hardness of the samples. Total viable aerobes, coliforms and fungi were below the levels of detection while TBA values were low and all samples possessed no detectable rancidity. Electrophoretograms of the samples indicated that cooking/equilibration had no significant effects on the proteins present but smoking led to a slight loss of some of the protein components. AA

Beef

430

Drumm (BM), McKenna (BM) and Joseph (RL). **Line chilling of beef 2: The effect on carcass temperature, weight loss and toughness.** *Journal of Food Engineering* 15(4): 1992: 285-312

The main objective of the work was to investigate the feasibility of replacing the present batch chilling process applied to beef carcasses, by a line or continuous process. Carcasses were cooled for 24 h in an exp. chill which was modified to simulate a chilling tunnel. Fans with infinitely variable speed controls, were used to blow chilled air over the round of each side. A data logger was used to record air temp., meat temp., air speeds, RH and the mass of one side at regular intervals. There was no significant difference between regimes with respect to toughness despite great variation in their severity. In order to reduce shrinkage form 1.2 to 0.8%, power consumption had to be more than doubled. Therefore chilling regimes need to be optimised (in economic terms). Orientation of sides with respect to fans was found to be an important factor affecting their cooling rate and shrinkage. AA

431

Skog (K), Jagerstad (M) and Laser Reutersward (A). **Inhibitory effect of carbohydrates on the formation of mutagens in fried beef patties.** *Food and Chemical Toxicology* 30(8): 1992: 681-688

Beef patties were prepared by mixing minced meat with water and either glucose (1,2 or 4%), lactose (1,2 or 4%) or powdered milk (2,4 or 8%) before frying. In another exp., minced meat was mixed with starch from golden bread crumbs (3%) or potatoes (4%), with and without glucose (1,2 or 4%). The patties (100 g) were fried for 3 min at 150 or 180°C in double-sided fryer. The mutagenic activity in the crust was determined using the Ames test. With the addition of glucose or lactose (1-4%), the mutagenic activity was inhibited by 34 - 76%. A similar inhibition of the mutagenic activity was obtained with powdered milk. However, starch from golden bread crumbs or potatoes caused only a slight (not significant) decrease in mutagenic activity whereas adding both starch and glucose to the beef patties inhibited mutagenic activity by up to 54%. AA

432

Findlay (CJ) and Barbut (S). **A response surface investigation of the effects of sodium chloride and tripolyphosphate on the thermal properties of beef muscle.** *Meat Science* 31(2): 1992: 155-164

433

Jackson (TC), Acuff (GR), Vanderzant (C), Sharp (TR) and Savell (JW). **Identification and evaluation of volatile compounds of vacuum and modified atmosphere packaged beef strip loins.** *Meat Science* 31(2): 1992; 175-190

434

Kesava Rao (V), Kowale (BN), Murthy (TRK) and Sharma (N). **Effect of processing and storage on neutral lipids of buffalo meat.** *Meat Science* 31(1): 1992; 25-34

Three muscles viz. *Triceps brachii* (TB), *Longissimus dorsi* (LD) and *Biceps femoris* (BF) from different anatomical locations of adult male buffaloes were stored after broiling and pressure cooking under refrigerated (4°C) condition for 3, 6, 9 days and 30, 60, 90 days under frozen (-10°C) storage. At the end of each storage interval they were analysed for total lipids, cholesterol contents and glyceride fractions i.e. monoglycerides (MG), diglycerides (DG), and triglycerides (TG). Muscles differed significantly in total lipids as well as contents of all glyceride fractions. Muscle LD had significantly higher total lipid content than TB and BF. Muscles differed significantly in their esterified cholesterol (EC) contents. Heat processing increased total lipids, cholesterol, MG, DG and TG contents of all the buffalo muscles studied. Total cholesterol contents remained unchanged during refrigerated and frozen storage. However, EC, MG, DG and TG contents declined during storage. The influence of anatomical locations on fatty acid composition of neutral lipids was observed. The ratio of unsaturated to saturated fatty acids increased due to cooking. A gradual decrease in mono- and polyunsaturated fatty acids was recorded during refrigerated and frozen storage. AA

435

Dransfield (E), Wakefield (DK) and Parkman (ID). **Modelling post-mortem tenderisation - I: Texture of electrically stimulated and non-stimulated beef.** *Meat Science* 31(1): 1992; 57-73

436

Dransfield (E), Etherington (DJ) and Taylor (MAJ). **Modelling post-mortem tenderisation - II: Enzyme changes during storage of electrically stimulated and non-stimulated beef.** *Meat Science* 31(1): 1992; 75-84

437

Dransfield (E). **Modelling post-mortem tenderisation - III: Role of calpain I in conditioning.** *Meat Science* 31(1): 1992; 85-94

Pork

438

Grant (IR) and Patterson (MF). **Effect of irradiation and modified atmosphere packaging on the microbiological and sensory quality of pork stored at refrigeration temperatures.** *International Journal of Food Science and Technology* 26(5): 1991; 507-519

The effect of combining low-dose irradiation (1.75 kGy) with modified atm. packaging (MAP) on the microbiological and sensory quality of pork chops stored at refrigeration temp. was studied. The microflora of irradiated MAP pork was almost exclusively composed of lactic acid bacteria, predominantly *Lactobacillus* spp. Modified atm. containing either 25 or 50% CO_2, balance N_2, resulted in the best microbial control in irradiated pork held at 4°C, compared to an unirradiated MAP control, and these atmospheres were subsequently used in sensory studies. The atm. containing 25% CO_2:75% N_2 maintained the uncooked colour and odour of irradiated pork chops more effectively than 50% CO_2:50% N_2. Therefore packaging in a modified atm. containing 25% CO_2, balance N_2, followed by irradiation to a dose of 1.75 kGy is recommended to improve the microbiological and sensory quality of pork chops. AA

439

Grant (IR) and Patterson (MF). **Effect of irradiation and modified atmosphere packaging on the microbiological safety of minced pork stored under temperature abuse conditions.** *International Journal of Food Science and Technology* 26(5): 1991; 521-533

The safety of irradiated pork packed in 25% CO_2:75% N_2 and stored at abuse temp. (10 or 15°C) was assessed by inoculation studies involving *Salmonella typhimurium*, *Listeria monocytogenes*, *Escherichia coli*, *Yersinia enterocolitica* and *Clostridium perfringens*. Irradiation to a dose of 1.75 kGy reduced pathogen numbers to below the detection limit of 10^2 cells g^{-1}. When higher inoculum levels were used (10^6 cells g^{-1}) irradiation at 1.75 kGy reduced pathogen numbers by 1 - > $5\log_{10}$ cycles depending on strain. *Clostridium perfringens* was the most resistant, and *Y. enterocolitica* the most sensitive of the pathogens studied. In all cases when high numbers (10^6 to 10^7 g^{-1}) of spoilage and/or pathogenic bacteria were present initially on the pork the meat appeared spoiled, and although irradiation reduced the number of microorganisms, the meat was still unacceptable from a sensory viewpoint after treatment. It was concluded that the microbiological safety of irradiated, modified atm. packaged (MAP) pork is better than that of unirradiated MAP pork. AA

440

Monahan (FJ), Buckley (DJ), Morrissey (PA), Lynch (PB) and Gray (JI). **Influence of dietary fat and α-tocopherol supplementation on lipid oxidation in pork.** *Meat Science* 31(2): 1992: 229-241

441

Nanu (E) and Narayan (KG). **Enterotoxin production by *Staphylococci* isolated from pork *kabab*, *Salami* and other sources by ELISA.** *Journal of Food Science and Technology (India)* 29(6): 1992: 383-384

The studies on enterotoxin production by staphylococci isolated from pork, *kabab*, *salami* and other sources as detected with ELISA, indicated the production of toxin by both coagulase positive and negative isolates. Few of the isolates produced enterotoxins C and D, while others produced either B, C or D toxins. The quantity of enterotoxin C produced by the isolates was in the range of 20 - 45 μg/ml. AA

442

Miri (A), Talmont (A), Renou (JP) and Monin (G). **^{31}P NMR study of postmortem changes in pig muscle.** *Meat Science* 31(2): 1992: 165-173

443

Essen-Gustavsson (B), Karlstrom (K) and Lundstrom (K). **Muscle fibre characteristics and metabolic response at slaughter in pigs of different halothane genotypes and their relation to meat quality.** *Meat Science* 31(1): 1992: 1-11

Products

444

Shahidi (F) and Hong (C). **Role of metal ions and heme pigments in autoxidation of heat-processed meat products.** *Food Chemistry* 42(3): 1991: 339-346

The effect of myoglobin (Mb), hemoglobin (Hb), hemin (Hm) and the preformed cooked cured-meat pigment (CCMP), as well as Fe(II), Fe(III), Cu(I) and Cu((II) on the oxidative stability of cooked comminuted pork was studied over a 21 day storage at 4°C. All these compounds, except CCMP, showed pro-oxidant activity. The pro-oxidant effect of metal ions was more pronounced at their lower oxidation state, as measured by the 2-TBA test. Addition of chelators, disodium salt of ethylenediaminetetraacetic acid and to a lesser extent sodium tripolyphosphate, inhibited the pro-oxidant activity of the above compounds. Addition of metal ions to the meats after cooking similarly enhanced the autoxidation of lipids in the above systems, thus reflecting the importance of processing conditions and equipment wear-out on the oxidative state of precooked meat products. AA

445

Rogov (IA), Kovalev (YI), Tokaev (ES) and Tokeev (AA). **Collagen and its rational content in meat products. 2. Experiments with growing rats.** *Meat Science* 31(2): 1992: 147-153

446

Hand (LW), Mandigo (RW) and Calkins (CR). **The effects of preblending time on physical and textural properties of coarse ground sausages.** *Meat Science* 31(1): 1992: 13-24

The effects of preblending storage time on physical and textural properties of coarse ground sausages were characterized. Raw materials (pork, beef) were preblended at 0-2°C and held for 0, 4, 8, 12, 16, 48, 96, 144, 196 or 240 h just prior to manufacture into Polish sausages. Expressible moisture (EM), raw batter stability, processing yield (PY), Instron compression (CO) and protein solubilization (SEM micrographs) increased from 0 to 16 h. No differences were observed for EM, PY and CO and in SEM micrographs for the 48 - 240 h interval. The effects of storage of preblends on sausage physical and textural properties (raw batter stability, yield, cohesiveness, SEM micrographs) occurred rapidly (0 - 16 h), reached a max. and either remained constant or diminished as storage time increased from 48 to 240 h. AA

447

Rogov (IA), Tokaev (ES), Kovalev (YI) and Tolstoguzov (VB). **Collagen and its rational content in meat products. Part. 1. Analytical studies.** *Meat Science* 31(1): 1992: 35-42

Computer-assisted simulation has been used to study the effect of collagen content on the biological value of meat proteins. It has been shown that an increase in the collagen content from 2.5% to 15 - 20% of the total amount of proteins contained in minced meat tangibly enhances proteins utilization for tissue synthesis. Hence, the above collagen content in meat products heightens their nutritional and biological value and renders them more suited for human metabolism. AA

Frankfurters

448

Yetim (H), Gokalp (HY), Kaya (M), Yanar (M) and Ockerman (HW). **Physical, chemical and organoleptic characteristics of Turkish style frankfurters made with an emulsion containing Turkish soy flour.** *Meat Science* 31(1): 1992; 43-56

The possibility of using Turkish Defatted Soy Flour (DSF) to replace part of the meat in Turkish style frankfurters was studied and the technological, physical, chemical, nutritional, sensory and quality characteristics of these sausages produced under Turkish conditions were determined. No significant difference in physical and sensory properties between the control group (all meat) and treatment groups (5, 10 and 20% soy flour) was found. DSF up to the level used significantly ($P > 0.01$) increased moisture and protein and decreased fat levels of the sausages. The amino acid and PER results also indicated that replacing meat with DSF in sausages did not significantly alter the nutritional value of the sausages. AA

Kababs

449

Mir Salahuddin, Kondaiah (N) and Anjaneyulu (ASR). **Effect of phosphate on the quality of buffalo meat *kababs*.** *International Journal of Animal Sciences* 6(1): 1991: 27-32

The effect of tetrasodium pyrophosphate, at 0.5% level was studied on the quality of *kababs* prepared from hot, chilled and frozen conditions, of buffalo meat. Hand mix (dough) was prepared and *kababs* were moulded on skewers and charbroiled. Emulsion stability and pH of mix, yield and taste panel scores of the charbroiled *kababs* were used as criteria for evaluation. The addition of phosphate increased the pH by more than 0.3 unit and significantly improved the emulsion stability and yield. Taste panel scores were better for all the parameters of appearance, flavour, juiciness, texture and overall acceptability. The yield of *kababs* increased by 4.36% (hot meat), 5.24% (chilled meat) and 6.07% (frozen meat) due to the addition of phosphate. The yield ranged from 77.74 to 80.22% in control compared to 82.98 to 84.58% in phosphate added samples. The beneficial effect of phosphate was observed in all the 3 conditions of buffalo meat handling. AA

Sausages

450

Ellerbroek (LI) and Steffen (G). **Effect of pasteurization and fermentation on residues of sulphonamides in sausages.** *International Journal of Food Science and Technology* 26(5): 1991: 479-483

The different effects of pasteurization and fermentation on sulphamethazine (SMZ) and sulphachlorpyridazine (SCP) were investigated in 2 common German meat products, luncheon meat and raw fermented sausages. There was no decrease in sulphonamide concn. (5 $\mu g\ g^{-1}$) in luncheon meat during the different stages of processing and storage (4°C up to 27 days). Less than 40% of the initial concn. remained in fermented sausages after ripening for 10 days in a climatized room. The sulphonamide content was reduced only if fermentation was involved in contrast with meat contaminated with other chemotherapeutic residues. AA

451

Katsaras (K) and Budras (K-D). **Microstructure of fermented sausage.** *Meat Science* 31(2): 1992: 121-134

A protein matrix is necessary for the desired texture of fermented sausages suitable for slicing. The formation of this network is predominantly induced by myosin and actin proteins. A change in the structure of native muscle proteins results from different technological processes such as chopping, salting and fermentation. During chopping with simultaneous release of meat proteins, the salt brings about a change in the original structure of proteins by swelling and partial sol. of myofibrils. The dissolved proteins are transformed into a thin fluid colloidal transition state, the so-called 'sol-state' with unstable coagulation bonds. During sausage ripening, as a result of denaturation by lactic-acid and due to gradual loss of water (drying), the unstable bonds are replaced by condensation bonds, and thus the sol-state is converted into the 'gel-state'. Both gel formation (condensation structure) and water evaporation (syneresis) result in the development of a matrix in fermented sausage and, consequently, in the texture of the sliceable product. AA

Poultry

Chickens

452

Parinyasiri (T), Chen (TC) and Reed (RJ). **Yields and breading dispersion of chicken nuggets during deep-fat frying as affected by protein content of breading flour.** *Journal of Food Processing Preservation* 15(5): 1991: 369-376

Battered and breaded chicken nuggets with low protein breading flour had significantly higher ($P < 0.05$) breading pickup than those with high protein flour. However, frying yields and batter and breading "drop" in the shortening were not affected ($P > 0.05$) by the protein content of breading flour. The protein content of flour affected significantly ($P < 0.05$) the dispersion of breading particles in shortening during deep fat frying e.g. the lower protein content resulted in greater concn. of suspended breading in the shortening. SD

453

Kondaiah (N), Anjaneyulu (ASR), Mir Salahuddin, Singh (RP) and Panda (B). **Effect of phosphate and spent hen yolk on the quality of chicken *patties* and *kababs* from spent hens.** *Journal of Food Science and Technology (India)* 29(6): 1992; 363-365

Addition of phosphate and ova yolk to chicken *patties* and *kababs* formulated with deboned meat and by-products (skin, gizzard and heart) from spent hens significantly improved emulsion stability, reduced cooking losses and imparted better acceptability to both the products. Shrinkage in diam. of *patties* was small and significantly lower in phosphate added samples. Sensory scores indicated significantly higher overall palatability scores in both cases. AA

Broilers

454

Mahendrakar (NS), Khabade (VS), Jagannatha Rao (R), Latha (R) and Dani (NP). **Influence of feeding fish and poultry viscera silages to broiler chicks on their performance and meat quality.** *International Journal of Animal Sciences* 6(1): 1991: 19-26

Two exp. were conducted with Cobb broiler chicks to investigate the influence of incorporating silages of fish and poultry offals and their replacement effects for fish meal in the diets on their performance and meat quality. The autolysates were prepared by ensiling fresh water fish viscera and poultry intestines and mixed with deoiled rice bran as carbohydrate filler and dried. About 50% of the protein in the dried diet was contributed by the offal. The isonitrogenous and isocaloric diets were formulated including offal autolysates, fish meal, oilcakes and cereals. The results revealed that the growth and overall performance of chicks fed with offal autolysates was comparable with that of fish meal in the diets provided the quantity of animal protein content in the diet is the same. The offal autolysates could be included at the level contributing about 3% animal protein in the diet replacing about 50% of the fish meal requirement of broiler chicks. Regarding organoleptic quality attributes of meat, inclusion of fish viscera autolysate resulted into fishy taint in muscle due to high visceral fat content. This problem could possibly be overcome by replacing visceral diet with commercial diet about a wk prior to slaughter. The offal autolysates also have a high fat content which serves as a source of energy. AA

Turkeys

455

Arteaga (GE) and Nakai (S). **Thermal denaturation of turkey breast myosin under different conditions: Effect of temperature and pH, and reversibility of the denaturation.** *Meat Science* 31(2): 1992; 191-200

The thermal denaturation and renaturation of turkey breast myosin (TBM) under different conditions of pH and temp. was evaluated by circular dichroism. TBM unfolds upon heating, and the degree of unfolding was dependent on the pH and temp. The transition temp. (T_m) of TBM at pH values of 6 and 12 was found to be 40°C, suggesting that TBM is more temp. sensitive than other myosins. Full reversibility of the thermal denaturation of TBM was usually present when TBM was heated for 5-30 min at 40°C for 5 min at 50°C and incubated for 24 h at 4°C. AA

Products

Eggs

456

Stephenson (P), Satchell (FB), Allen (G) and Andrews (WH). **Recovery of *Samonella* from shell eggs.** *Journal of the Association of Official Analytical Chemists* 74(5): 1991; 821-826

A preenrichment procedure and a direct selective enrichment procedure were compared for recovery of *Salmonella* artificially inoculated into liquid whole egg, egg yolk, and egg albumen. For liquid whole egg and egg yolk, the 2 procedures were comparable. With egg albumen, however, pre-enrichment in lactose broth gave significantly higher recoveries than did direct selective enrichment in either selenite cystine or tetrathionate broths. The lactose pre-enrichment procedure was used to determine the survival of *S. enteritidis* in egg yolk and egg albumen over a period of 7 days. As shown by most probable number detn., counts of *S. enteritidis* inoculated into egg albumen decreased by 3 log units, whereas those in egg yolk did not change significantly. It is recommended, therefore, that only the egg yolk be examined for this pathogen. In a comparison of 5 different pre-enrichment media (lactose broth, brain heart infusion broth, trypticase soy broth, buffered peptone water, and nutrient broth), lactose broth was some what less productive than the other 4 media for the recovery of *Salmonella* from egg yolks. Trypticase soy broth gave the highest recovery. AA

SEAFOODS

457

Sukumaran (CT). **Seafood export via aluminium packaging.** *Packaging India* 24(6): 1992: 11-13

Squids

458

Lin (J-K) and Ho (YS). **Hepatotoxicity and hepatocarcinogenicity in rats fed squid with or without exogenous nitrite.** *Food and Chemical Toxicology* 30(8): 1992: 695-702

The popular seafood squid contains high levels of naturally occurring amines such as dimethylamine (DMA), trimethylamine and trimethylamine-N-oxide (TMAO). The hepatotoxicity and hepatocarcinogenicity of squid with or without exogenous nitrite were investigated in rats. Acute necrosis including polymorphogenic neutrophil infiltration, haemorrhage and cholangiofibrosis were observed in the livers of most rats fed squid. Hepatocellular carcinoma (HCC) was induced in two out of 12 rats (16%) by feeding 10% squid in Purina rat chow for 10 months. The incidence of HCC was increased to 4 out of 10 rats (33%) when 0.3% $NaNO_2$ was added to the above diet. At the end of the exp. a marked elevation of serum γ-glutamate transferase was observed in treated groups, but no significant changes in the activities of serum glutamic-oxaloacetic transaminase and glutamic-pyruvic transaminase were detected. Vitamin C (0.3%) gave partial protection against hepatic damage. The concn. of DMA in squid is estimated to be 0.19%; this concn. did not induce HCC under the experimental conditions used. Therefore it is suggested that another major naturally occurring amine in squid, TMAO, could be one of the important factors involved in the induction of hepatotoxicity and hepatocarcinogenicity in rats. AA

Fish

459

Senthil (A), Srikar (LN) and Vidya Sagar Reddy (G). **Effect of frozen storage on protease and lipase activities of oil sardine and ribbon fish.** *Journal of Food Science and Technology (India)* 29(6): 1992: 392-394

Highest protease activity was observed in whole gut of oil sardine and ribbon fish. On the contrary, lipase activity was found to be the highest in liver of both the sp. Statistically, significant decreases in the activities of proteases and lipases were found to occur in various tissues of oil sardine and ribbon fish during frozen storage. AA

Cod

460

LeBlanc (EL) and LeBlanc (RJ). **Determination of hydrophobicity and reactive groups in proteins of cod (Gadus morhua) *muscle during frozen storage.*** *Food Chemistry* 43(1): 1992: 3-11

Commercially harvested and processed fillets of Northern bank trawl cod, frozen stored for 300 days at -30, -22, -15 and -12°C were used in the study. Sarcoplasmic, myosin-rich and SDS-soluble protein fractions from each treatment were evaluated for surface hydrophobicity, total, available and unavailable SH-, SS-, aldehydes, free NH_2- and ester-link content changes in hydrophobicity is caused in 3 fractions not only by increasing in SS-bonding, but also by ester links, aldehydes and free NH_2-groups. SD

Sardines

461

Beltran (A) and Moral (A). **The effects of fat content and storage temperature on the storage life of smoked sardine fillets (*Sardina pilchardus* W.) prepared from frozen sardine.** *Food Chemistry* 42(3): 1991: 347-356

Smoked fillets were made from sardines stored for 3 and 6 months at -18°C. Fillets made from 3 months frozen sardines or sardines with higher fat content were softened at 1°C storage. Fillets made from sardine with lower lipid content and stored at -18°C were rancid due to sharp drop in smoked flavour. Fillets made from sardines with lower fat content frozen for 6 months were affected in shelf-life due to the level of oxidation in the raw material. SD

PROTEIN FOODS

462

Faughnan (KT) and Woodruff (MA). **Modified gas chromatographic/mass spectrometric method**

for determination of daminozide in high protein food products. *Journal of the Association of Official Analytical Chemists* 74(4); 1991; 682-692

A modified version of the Conditt and Baumgardner GC/MS method for detn. of daminozide in peanut butter and raw peanuts is described. Daminozide in the food product is hydrolyzed to unsymmetrical dimethylhydrazine (UDMH) by sodium hydroxide digestion. The generated UDMH is distilled from the food matrix and captured by reaction with salicylaldehyde in a condensation trap. Resulting high pH distillates generated by peanuts and peanut products are adjusted back to a pH of 5 - 6 through addition of glacial acetic acid. After thermal incubation and extraction into methylene chloride, salicylaldehyde dimethylhydrazone is separated from interferences by capillary GC and quantitated by MS using the selective ion monitoring (SIM) mode. Quantitation of daminozide is based on the ratio of the salicylaldehyde dimethylhydrazone molecular ion (m/z 164) to the molecular ion (m/z 153) of the internal standard, 4-nitroanisole. Confirmation of daminozide identity is determined by relative intensity of the m/z 164 ion to the m/z 120 (C_7H_4ON) ion. Improved m/z 164 ion intensity and reduction of neighbouring interferences due to acetic acid treatment permitted a daminozide detection limit of 0.005 p.p.m. in a 50 g sample and an associated 0.02 p.p.m. limit of quantitation. This modification is specific for high protein samples that generate high pH distillates such as peanuts and peanut products and is not specifically intended for analysis of low protein samples. AA

Infant foods

463

Del Valle (FR), Escobedo (M), Sanchez-Marroquin (A), Bourges (H), Bock (MA), Biemer (P). **Nitrogen balance in infants fed formulas containing amaranth or a soy-oats formula.** *Cereal Chemistry* 69(2); 1992; 156-159

A nitrogen balance study of 10 infants 5 to 18 months old compared 2 infant formulas containing amaranth (*Amaranthus cruentus*) with a soy-oats formula. Analysis of covariance techniques were used to investigate significant differences between types of formula with respect to nitrogen absorption and retention. Infant wt. and nitrogen intake were used as covariates in order to adjust the dependent variables to a constant level of each of these covariates. No significant differences (P less than or equal to 0.05) were found among the 3 formulas with respect to either nitrogen absorption or nitrogen retention. AA

ALCOHOLIC AND NON-ALCOHOLIC BEVERAGES

Alcoholic beverages

Beer

464

Kaneda (H), Kano (Y), Kamimura (M), Kawaskishi (S) and Osawa (T). **A study of beer staling using chemiluminescence analysis.** *Journal of the Institute of Brewing* 97(2); 1991; 105-110

The chemiluminescence (CL) analysis has been used to study beer staling. Several types of commercial Japanese beers were stored at 37°C and their CL development analysed at 60°C. The CL level in beer developed as the beer was stored to reach a max. level and then decreased. The sum of the CL intensities for the first 1 h showed a good relationship with staling degree as assessed in mean panel scores. It is postulated that the deterioration rates of beer might be assessed from the CL producing patterns in the fresh beers before storage. The presence of sulphite in beer depressed the CL production during its storage indicating that there is some contribution of sulphite to flavour stability due to its inhibitory effect on radical reactions in beer. AA

Wines

465

Ibe (A), Saito (K), Nakazato (M), Kikuchi (Y), Fujinuma (K), Nishima (T). **Quantitative determination of amines in wine by liquid chromatography.** *Journal of the Association of Official Analytical Chemists* 74(4); 1991; 695-698

A liquid chromatography (LC) procedure is described for the detn. by dansylation of the following 16 kinds of biogenic amines found in wine: monoethylamine (MM), ethylamine (EM), iso- and n-propylamine (Pr), iso-and n-butylamine (Bu), iso- and n-amylamine (Am), pyrrolidine (PY), 2-phenethylamine (PH), tryptamine (TR), putrescine (PU), cadaverine (CA), histamine (HI), tyramine (TY), and spermidine (SP). The amines in white and red wine were applied to a column of Amberlite CG-50 type I resin (Na-form) after the column had been washed with water and eluted with 1N HCl acid. This eluate was evaporated to dryness under reduced pressure and derivatized with dansyl chloride (DNS). LC separations were performed on Finepak SIL C 18S and LiChrosorb RP-8 columns with an acetonitrile-water elution gradient. In the survey of commercial wines by this method, most of the samples were found to contain 12 amines, including iso-Am, CA, PU, TY and others. The highest levels of these amines were 4.48 µg

PU/mL in red wine, and 5.11 µg iso-Am/mL in white wine. The total levels of amines in red wine were comparatively higher than in white wine. AA

Non-alcoholic beverages

Fruit juices

466

Kantasubrata (J) and Imamkhasani (S). **Analysis of additives in fruit juice using HPLC.** *ASEAN Food Journal* 6(4): 1991: 155-158

A method is described for the simultaneous estimation of saccharin, sorbic and benzoic acids (widely used preservatives in Indonesian commercial fruit juices) by HPLC using µ-Bondapak CN column and a mixture of 2% acetic acid/methanol (95:5) as eluent. The absorbance ratio at 2 wavelengths (254 and 240 nm) is used for confirming peak identity. SRA

Grape juices

467

Rao (MA) and Cooley (HJ). **Role of cultivar and press aid in pressing characteristics and juice yields of crushed grapes.** *Journal of Food Process Engineering* 15(1): 1992: 65-79

The stress-vol. characteristics of crushed grape cvs: Baco Noir, Cabernet Sauvignon, Catawba, Cayuga White, Chardonnay, Concord, Delaware, Melody, Niagara, Johannisberg Riesling, and Seyval Blanc, with and without paper and rice hulls press aids were studied in an expression cell and an Instron Universal Testing Machine. The slopes of ln stress vs vol. in compression were significantly ($P < 0.001$) dependent on the grape cv. Addition of 1 - 3% press aid by wt. decreased the magnitudes of slopes by about 11% with Seyval Blanc to about 51% with Catawba; i.e., the ease with which pressing could be performed increased with the addition of press aid. With Cabernet Sauvignon grapes, addition of press aid 0.5, 1.0 and 2.0% resulted in increase in slopes ranging between 14.7 and 24.9%. The slopes of the ln stress-ln time during the relaxation portion of the exp. were also significantly dependent ($P < 0.001$) on the grape cv; the magnitudes of the slopes increased with the addition of 1 - 3% paper press aid. The juice yields were affected significantly ($P < 0.001$) by the addition of paper press aid, with max. yields being obtained when 1 - 2% (w/w) paper press aid was added. As expected, juice yields (w/w%) were significantly dependent ($P < 0.001$) on grape cvs. AA

Jackfruit juices

468

Seow (CC) and Shanmugan (G). **Storage stability of canned jackfruit (*Artocarpus heterophyllus*) juice at tropical temperature.** *Journal of Food Science and Technology (India)* 29(6): 1992: 371-374

Internal plain tinplate can corrosion and depletion of vitamin C in canned jackfruit juice, with or without added nitrate were found to follow zero-order kinetics during storage at 30 - 50°C. The activation energy followed the order of Fe dissolution > tin dissolution > vitamin C depletion. The presence of nitrate accelerated all 3 processes without significantly ($P < 0.05$) affecting E_a values. Based on a max. permissible tin level of 250 mg/kg, tin dissolution appeared to be the predominant factor limiting the shelf-life of the product rather than depletion of vitamin C. It was estimated that properly processed jackfruit juice packed in plain tinplate cans could keep well for > 17 months at storage temp. < 30°C and in the absence of corrosion accelerators such as nitrates. AA

Tangerine juices

469

Ilangantileke (SG), Ruba (ABJr) and Joglekar (HA). **Boiling point rise of concentrated Thai tangerine juices.** *Journal of Food Engineering* 15(3): 1991: 235-243

To improve the design and optimisation of multiple-effect evaporators, the boiling point rise (BPR) of Thai tangerine juice was determined at different solute concn. and operating pressures, ranging from 67.74 to 35.41°Brix and from 700 to 123 mbar, respectively. Having observed that the amount of sucrose hydrolysed during a series of heat treatments was negligible, a series of mathematical relationships was used to reconstruct the experimental BPR values, thus showing that a modified version of the Crapiste-Lozano model allowed a closer fit to the experimental data. AA

Soft drinks

470

Krishna Murthy (MN), Rajalakshmi (S), Satyabodha (JA) and Nagaraja (KV). **A qualitative colorimetric test for brominated vegetable oil in soft drinks.** *Journal of the Association of Official Analytical Chemists* 74(4): 1991: 698-699

A simple and precise method of detecting brominated vegetable oil (BVO) in soft drinks is described. After extraction of BVO using diethyl ether, the concentrated ethereal sol. was treated with a small quantity of Zn dust to convert the organic bromide to inorganic form; the sol. was subsequently treated with lead dioxide to liberate bromine. The bromine evolved was detected by means of fluorescein-impregnated filter paper strip that turns pink because eosin is formed. The test can detect as low as 10 p.p.m. (2 mg/200 ml) of BVO under experimental conditions. GC was carried out on sodium methoxide derivatives prepared from ether extract for quantitation. AA

Tea

471

Sahin (Y), Nas (S) and Gokalp (HY). **Effect of shooting period, region of growth and processing method on the Fe and Mn content of tea determined by X-ray fluorescence.** *International Journal of Food Science and Technology* 26(5): 1991: 485-492

X-ray fluorescence (XRF) is an effective technique for qualitative and quantitative analysis of minerals in various agricultural products. Simplicity, high throughput and the possibility of automation make it useful for screeing large numbers of samples. Samples of 138 fresh green, black tea and residue of this black tea after brewing were obtained from the Eastern Black Sea region of Turkey and analysed for Fe and Mn content using XRF. Such work appears not to have been reported so far. AA

472

Ravichandran (R) and Dhandapani (M). **Composition characteristics and potential uses of South Indian tea seeds.** *Journal of Food Science and Technology (India)* 29(6): 1992: 394-396

The analytical data on tea seed and the seed oil indicate the possible use of tea seed oil for edible purposes. AA

FATS AND OILS

Fats

473

Bergholz (CM). **Safety evaluation of olestra, a nonabsorbed fat-like replacement.** *CRC Critical Reviews in Food Science and Nutrition* 32(2): 1992: 141-146

Olestra is the mixture of the hexa-, hepta-, and octa esters of sucrose with long chain fatty acids from any edible oil. Its physical properties are comparable to those of triglycerides, but it is not digested by lipolytic enzymes or absorbed and therefore is noncalorie. Technically, it can replace fat in a wide variety of foods and can be used to make cooked, baked, and fried foods lower in fat and calories. A Food Additive Petition is under review by the FDA, which is comprised of results of extensive testing in animals and humans. The major areas of investigation are metabolism and absorption, chronic toxicity, mutagenicity, carcinogenicity, reproductive and developmental toxicity, safety for gastrointestinal tract, nutrition, and the potential for olestra to affect absorption of drugs. This testing involved studies in 5 different species of animals and over 30 clinical investigations. The results of this research support the safety of olestra for use in foods. 18 references. AA

Oils

474

Gordon (MH) and Griffith (RE). **Steryl ester analysis as an aid to the identification of oils in blends.** *Food Chemistry* 43(1): 1992: 71-78

A steryl ester-rich fraction isolated from 14 oil samples by TLC and analysed by GC and HPLC after optimizing conditions showed that GC was more sensitive, having the advantage of the separation of the residual triacylglycerols from steryl esters and found to be useful for identifying mixtures in oils. SD

475

Gavriilidou (V) and Boskou (D). **Chemical interesterification of olive oil-tristearin blends for margarines.** *International Journal of Food Science and Technology* 26(5): 1991: 451-456

Refined olive oil-glycerol tristearate blends were interesterified using sodium methoxide as catalyst. The glyceride structure of the randomized fats was studied and the relationship between the structure and physical properties was examined. The rearranged fats were investigated for Solid Fat Index, melting behaviour, consistency and spreadability and the values obtained were compared to those of zero-trans margarines or commercially available products prepared from hydrogenated olive oil and other vegetable oils. The 80:20 and 75:25 olive oil-tristearin blends after randomization have properties very close to those of soft tub and packet margarines. AA

Palm oils

476

Manorama (R) and Rukmini (C). **Effect of processing on β-carotene retention in crude palm**

oil and its products. *Food Chemistry* 42(3); 1991; 253-264

β-Carotene ammounting to 70% of the total carotenes in Indian crude palm oil (CPO) was estimated around 370 p.p.m. by non-aqueous reverse phase HPLC method (UV-V detector at 450 nm) with a high sensitivity and accuracy. 70 - 88% of β-carotene was retained in baked, seasoned, deep fried and shallow fried foods but there was total loss at fourth frying stage of consecutive use of oil affecting sensory and physico-chemical properties. CPO being suitable for products like cake, *upma*, *kichidi* and *suji halwa* prepared by single frying for a short duration can be ideal for vitamin A supplementation to vulnerable children. SD

SPICES AND CONDIMENTS

Papads

477

Deepa (CR), Asna Urooj and Shashikala Puttaraj. **Effect of addition of soy flour on the quality characteristics of blackgram (*Phaseolus mungo* L.) *Papads*.** *Journal of Food Science and Technology (India)* 29(6); 1992; 385-387

The effect of addition of soy flour (10 - 70%) to blackgram *papad* making, showed no change in the dough texture, though rolling property was affected. Greater amounts of water were needed for mixing the dough with an increase in soy flour concn. Elasticity was reduced to a min. at 40% and was completely absent at 50 %. Quality characteristics remained the same for both the raw *papads*. However, the quality of fried *papads* decreased beyond 60% addition of soy flour. Acceptability decreased with increase in percent soy flour added. The results suggest that an addition of 30 - 40% of soy flour would not make a significant difference in the physical and sensory characteristics of blackgram *papad*. AA

Spices

478

Srinivasan (K) and Sambaiah (K). **The effect of spices on cholesterol 7α-hydroxylase activity and on serum and hepatic cholesterol levels in the rat.** *International Journal for Vitamin and Nutrition Research* 61(4); 1991; 364-369

The effect of feeding curcumin, capsaicin, ginger, mustard, black pepper and cumin on cholesterol and bile acid metabolism was studied in rats. The activity of hepatic cholesterol-7α-hydroxylase, the rate-limiting enzyme of bile acid biosynthesis, was significantly elevated in curcumin (turmeric), capsicum (red pepper), ginger and mustard treated animals. The enzyme activity was comparable to controls in black pepper and cumin fed rats. Serum and liver microsomal cholesterol contents were significantly higher in the curcumin and capsaicin treated animals. Thus, this study has suggested that the spices-turmeric, red pepper, ginger and mustard can stimulate the conversion of cholesterol to bile acids, an important pathway of elimination of cholesterol from the body. However, simultaneous stimulation of cholesterol synthesis by the spice principles - curcumin and capsaicin suggests that there may not be any significant contribution of stimulation of bile acid biosynthesis to the hypocholesterolemic action of these spices, and the latter action may solely be due to interference with exogenous cholesterol absorption. AA

Paprika

479

Vinas (P), Cordoba (MH) and Sanchez-Pedreno (C). **Determination of ethoxyquin in paprika by high performance liquid chromatography.** *Food Chemistry* 42(3); 1991; 241-251

A new reverse-phase HPLC method using gradient elution technique, UV detection at 270 nm, fluorimetric detection with excitation at 311 nm, emission at 444 nm and detection limit at 0.2 µg/ml is proposed to determine ethoxyquin in commercial samples of paprika used to retard the decomposition of some pigments. SD

SENSORY EVALUATION

480

Bottiglieri (P), De Sio (F), Fasanaro (G), Mojoli (G), Impembo (M), Castaldo (D). **Rheological characterization of ketchup.** *Journal of Food Quality* 14(6); 1991; 497-512

The ketchup flow behaviour, which is highly subjected to the production technology and the raw materials, cannot be described adequately by the Harper and El Sahrigi equation as well as the equation that links the apparent viscosity of ketchup to the serum viscosity. SD

FOOD STORAGE

Nil

INFESTATION CONTROL AND PESTICIDES

481

Srinivasan (K), Mahadevappa (KL) and Radhakrishnamurthy (R). **Toxicity of β- and γ-hexachlorocyclohexane in rats of different ages.** *Bulletin of Environmental Contamination and Toxicology* 47(4): 1991: 623-627

Male Wistar rats of 5 different age groups (5, 10, 16, 32 wks and 16 months) were fed with diets containing 80 mg% β-HCH or γ-HCH and 21% casein, 10% cane sugar, 10% peanut oil, 1% vitamin mix, 2% salt mix and 56% corn starch. Results showed that the body wt. of rats of any age group were not affected by HCH treatments. The liver wt. were increased more in younger rats as compared to aged rats. The increase in liver wts. caused by β-HCH over the corresponding controls was 99, 67, 44, 41 and 24% respectively and liver wts. caused by γ-HCH over the corresponding controls was 40, 40, 31, 18 and 13% respectively. Significant increase in kidney wt.s were seend only in 5 and 10 wks age rats, and HCH isomer had no effect on rats of higher age group. SRA

BIOCHEMISTRY AND NUTRITION

482

Kaur (S) and Kawatra (BL). **Effect of quality of protein and levels of vitamin A on protein metabolism in rats.** *Indian Journal of Nutrition and Dietetics* 28(3): 1991: 82-89

Wheat and Bengal gram flours were mixed in 70:30 proportion and chapathies (unleavened bread) were made and dried in a oven at 50 - 70°C overnight and ground to a fine powder. The diets were fed for 4 wks to albino rats (Wistar strains) as such at 10% protein level or after supplementing with 5% milk powder. The % protein, fibre, ether extract, minerals and vitamins in the diets were maintained constant but vitamin A content was either deficient or normal (2000 IU vitamin A/100 g diet) or high (25,000 IU/100 g diet). Deficiency of vitamin A in wheat plus Bengal gram flour chapathi diet fed group showed decrease in gain in body wt. PER, protein digestibility and decrease in vitamin A stores, liver nitrogen, urea and ammonical nitrogen in plasma and increased urinary nitrogen excretion than the normal vitamin A level diet fed group. The high vitamin A level diet fed rats produced significantly more faecal N and lower protein digestibility than the normal vitamin A level diet fed rats. GS

483

Gerster (H). **Potential role of β-carotene in the prevention of cardiovascular disease.** *International Journal for Vitamin and Nutrition Research* 61(4): 1991: 277-291

Patients with stable angina pectoris who took 50 mg β-carotene every other day for more than 2 yr, experienced only half as many cardiovascular events as those taking place. This may be ascribed to the antioxidant effect of β-carotene or to an increase in plasma high-density lipoprotein known to reduce cardiovascular disease risk. 82 references. GS

484

Wang (TS), Chang (WH) and Chiang (BH). **The manufacture of cysteine using an electrochemical membrane reactor.** *Journal of Food Engineering* 15(3): 1991: 209-219

Conversion of cystine to cysteine was carried out in a batch recirculation type electrochemical membrane reactor. The reactor was constructed with a lead plate as cathode, and platinum as anode. The catholyte was cystine in HCl sol., and the anolyte was 0.1 N H_2SO_4 sol. The catholyte and anolyte were separated by a cation exchange membrane. When the electrode distance was 0.65 cm, catholyte concn. was 0.4 M cystine, the process was operated at 30°C, 200 ml/min of flow rate and 20 mA/cm^2 of current density, a current efficiency of 91.5% could be achieved. After electrochemical reaction was completed, the cysteine crystal was obtained by further concn. and crystallization. The overall recovery of cysteine crystal reached 91%. AA

485

Johnson (MA), Fischer (JG) and Kays (SE). **Is copper an antioxidant nutrient ?.** *CRC Critical Reviews in Food Science and Nutrition* 32(1): 1992: 1-31

This review identified biochemical and clinical roles of Cu as an antioxidant. Cu as biological antioxidant, practical implications in health and disease and recommendations for research are the aspects covered in this article. 252 references. SRA

486

Hemila (H). **Vitamin C and plasma cholesterol.** *CRC Critical Reviews in Food Science and Nutrition* 32(1): 1992: 33-57

Reports of animal studies show that vitamin C participates in cholesterol metabolism, and the most significant effect of the vitamin appears to be on the catabolism of cholesterol. Several intervention studies suggest that vitamin C may also have a substantial role in human cholesterol metabolism. Aspects reviewed in this article are: cholesterol metabolism (guinea pigs, rabbits and pigs, effect of cholesterol on vitamin C metabolism, lipoproteins and lipid oxidation), triglyceride metabolism, physiological studies in man and primates (acute scurvy, supplementation and depletion in man), intervention studies (pretreatment cholesterol level, other factors possibly affecting the results, HDL-cholesterol and triglycerides), epidemiological studies (cholesterol, HDL-cholesterol and triglycerides, mortality and morbidity), and conclusions (nutritional recommendations, prevalence of low vitamin C levels). 279 references. SRA

487

Bradbury (JH). **Properties and analysis of antinutritional factors in foods.** *ASEAN Food Journal* 6(4): 1991: 123-128

Five most important antinutritional factors (enzyme inhibitors, cyanogenic glucosides, lectins, glucosinolates and saponins) are discussed in this review. 40 references. SRA

488

Craven (GS) and Reardon (K). **Analysis of trace minerals in foods.** *ASEAN Food Journal* 6(4): 1991: 129-140

Trace minerals (nutritional and toxicological factors), analytical methodologies (sampling, destruction of organic matter, detection techniques for trace minerals), detailed methodological aspects, analytical quality assurance, review of other methods and techniques, lab. trace mineral results summary (Cu in crustacea, Se in crustacea, As in marine plant material, Hg in shark, Cu and Se in nuts) are covered in this review. 42 references. SRA

489

Dausch (JG). **The problem of obesity: Fundamental concepts of energy metabolism gone awry.** *CRC Critical Reviews in Food Science and Nutrition* 31(4): 1992: 271-298

Review. 70 references. SRA

490

Rumney (CJ) and Rowland (IR). ***In vivo* and *in vitro* models of the human colonic flora.** *CRC Critical Reviews in Food Science and Nutrition* 31(4): 1992: 299-331

The advantages and disadvantages of various *in vitro* systems for studying gut microflora and its metabolic activity (from simple static cultures to the more sophisticated continuous and semicontinuous flow models) are reviewed. The apparatus involved is described with practical information on media, running conditions and sampling. The bacteriological and metabolic criteria for establishing the similarity of the models to the *in situ* colonic flora are also discussed. The major applications (current and future) of the models, including fermentation studies on the dietary fiber, metabolism of nutrients and foreign compounds (including carcinogens) in food, and the investigation of colonization resistance are reviewed. Interms of *in vivo* models, the application of conventional lab. animals to toxicity of chemicals and gastrointestinal infections are also discussed in this review. 116 references. SRA

491

Carpenter (CE) and Mahoney (AW). **Contributions of heme and nonheme iron to human nutrition.** *CRC Critical Reviews in Food Science and Nutrition* 31(4): 1992: 333-367

This review evaluates the contributions of both heme and nonheme Fe in establishing and maintaining a healthful Fe status. The human requirement of Fe, bioavailability of heme and nonheme Fe, amounts of heme and nonheme Fe inthe diet are individually estimated after reviewing relevant literature. 238 references. SRA

492

Metcalfe (DD). **The nature and mechanisms of food allergies and related diseases.** *Food Technology* 46(5): 1992: 136-139

The term food allergy and its classification into immunoglobin-E-mediated disease, immune-complex reactions and delayed-hypersensitivity-induced diseases are explained in this article. Aspects covered are the differential diagnosis which include enzyme deficiencies, gastrointestinal disease, anatomical defects, reaction to additives, toxins and contaminants, collagen vascular diseases, endocrine disorders and psychological factors; controversial diagnoses and tests and proper classification of food-related diseases. CSA

493

Sampson (HA). **Food hypersensitivity: Manifestations, diagnosis and natural history.** *Food Technology* 46(5): 1992: 141-144

Aspects dealt in this article are the pathogenesis of food hypersensitivity: various clinical manifestations of food hypersensitivity such as food-induced gastrointestinal hypersensitivity, food-induced respiratory hypersensitivity, food-induced cutaneous hypersensitivity, food-induced generalised anaphylaxis and other food-induced symptoms; diagnosing food allergy; treatment of food hypersensitivity; natural history of food hypersensitivity and the importance of ingredient labeling. CSA

494

Taylor (SL). **Chemistry and detection of food allergens.** *Food Technology* 46(5): 1992: 146, 148-152

Highlights the progress made in the characterization and identification of food allergens in milk, eggs, legumes, seafood, grains, fruits and vegetables and the immunoassays to test the presence of allergens in foods. CSA

495

Samah (OA), Putih (MF) and Selamat (J). **Biochemical changes during fermentation of cocoa beans inoculated with *Saccharomyces cerevisiae* (Wild strain).** *Journal of Food Science and Technology (India)* 29(6): 1992: 341-343

The overall pH profile of the cotyledon in the inoculated beans during fermentation was slightly higher than the control beans. The % of glucose remaining in the pulp of both the inoculated and control beans at the end of fermentation were 20% and 3% respectively. Ethanol and acetic acid production are generally higher in the inoculated beans as compared to the control beans. The intensity of chocolate flavour obtained from the inoculated and control beans was almost the same. However, in the inoculated beans, bitterness was reduced by 28%. AA

TOXICOLOGY

496

Scheuplein (RJ). **Perspectives on toxicological risk - an example: Foodborne carcinogenic risk.** *CRC Critical Reviews in Food Science and Nutrition* 32(2): 1992: 105-121

This review article indicates that both epidemiological data and the simplest kind of risk assessment agree that foodborne carcinogenic risk probably overwhelmingly originates from the food itself and not from additives, pesticides or contaminants. Aspects covered include: attribution of cancer risks (direct food additives, GRAS substances, pesticides and contaminants, naturally occurring carcinogens, carcinogens in traditional food and spices and flavours), food preparation and mycotoxins. 64 references. SRA

497

Meijer (GW), Janssen (GB), Beynen (AC) and Speijers (GJA). **Is dietary ergotamine atherogenic in the rabbit ?.** *Food and Chemical Toxicology* 30(8): 1992: 731-734

The effect of dietary ergotamine on pre-lesional indicators of atherosclerosis was studied in rabbits. The experimental purified diets contained 0.08% (w/w) cholesterol and either 0, 40 or 200 mg ergotamine-tartrate/kg. After 6-wk, serum total cholesterol concn. and the ratio of serum total cholesterol:high-density lipoprotein-cholesterol were significantly increased by ergotamine in a dose-dependent manner. Dietary ergotamine raised the total level of glycosaminoglycans and the relative proportion of chondroitin sulphate in the abdominal aorta. It is suggested that dietary ergotamine is atherogenic in the rabbit. AA

FOOD LAWS AND REGULATIONS

498

Thompson (MS). **Issues associated with the use and regulation of fat substitutes.** *CRC Critical Reviews in Food Science and Nutrition* 32(2): 1992: 123-126

499

Borzelleca (JF). **The safety evaluation of macronutrient substitutes.** *CRC Critical Reviews in Food Science and Nutrition* 32(2): 1992: 127-139

Guidelines for the safety evaluation of macronutrient substitutes described in this article recognizes the uniqueness of these materials and the limitations of current methods of these materials and the limitations of current methods and proposes the utilization of animal and human data, consideration of nutritional and toxicological effects, special attention to kinetic and dispositional data, the use of nontraditional safety/uncertainity factors and the use of post-marketing surveillance. 12 references. SRA

500

Rodricks (JV), Starr (TB) and Taylor (MR). **Evaluating the safety of carcinogens in food. Current practices and emerging developments.** *Food Drug Cosmetic Law Journal* 46(5): 1991: 513-552

This article reviews the origin and application of the one-in-one million benchmark for "negligible risk" or "safety" judgements about carcinogens, and examines the basis for the agencies' confidence that assessed the lifetime risk at or below the level satisfy a protective food safety standard. The review concludes with the recent developments in risk assessment such as use of pharmacokinetic and human data, new understanding and application of information on the mechanisms of carcinogenesis and more accurate evaluations of human exposures to dietary substances. SD

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Regd. No. 36729/84

Printed and published by Director, Central Food Technological Research Institute,
Mysore -570 013, at CFTRI Printing Press. Editor: Shri K. A. Ranganath,
CFTRI, Mysore.